GENERAL DESCRIPTION

NOTE: For information pertaining to the Fleetwood Eldorado, refer to the latter portion of this section.

The same basic Turbo Hydra-matic automatic transmission, Fig. 7-1, is used on all 1969 Cadillac cars. There are some differences between transmissions, however, dependent upon the series car. The transmissions used are identified by the large letters AA or AB that appear in the upper corners of the name plate, Fig. 0-1, located on the right hand side of the transmission.

Transmissions bearing the designation AA are used on 680, 681, 682, and 683 series cars. Those bearing the designation AB are used on 697 and 698 cars. Different speedometer gearing arrangements are used for each transmission.

The Turbo Hydra-matic transmission is a fully automatic unit consisting primarily of a 3-element hydraulic torque converter and a compound planetary gear set. Three multiple-disc clutches, a sprag unit, a roller clutch unit, and two bands provide the friction elements required to obtain the desired functions of the compound planetary gear set.

The torque converter, the clutches, the sprag and roller clutch, couple the engine to the planetary gears through oil pressure, providing three forward speeds and reverse. The torque converter, when required, will supplement the gears by multiplying engine torque.

The torque converter is of welded construction and is serviced as an assembly. The unit is made up of two vaned sections, or halves, that face each other in an oil filled housing. The pump half of the converter is connected to the engine and the turbine half is connected to the transmission.

When the engine makes the converter pump revolve, it sends oil against the turbine, making it revolve also. The oil then returns in a circular flow back to the converter pump, continuing this flow as long as the engine is running.

The converter also has a smaller vaned section, called a stator, that funnels the oil back to the converter pump through smaller openings, at increased speed. The speeded up oil directs additional force to the engine-driven converter pump, thereby multiplying engine torque.

A hydraulic system pressurized by an internal-external type gear pump provides the working pressure required to operate the friction elements and automatic controls.

External control connections to the transmission are:

Manual Linkage - To select the desired operating range.

Engine Vacuum - To operate a vacuum modulator unit.

12 Volt Electrical Signals - To operate an electrical detent solenoid used on all transmissions.

Gear or Torque ratios of the transmission are as follows:

First = 2.48:1 gear ratio
Second = 1.48:1 gear ratio
Third = 1.0:1 gear ratio
Reverse = 2.08:1 gear ratio

Each gear ratio can be multiplied by as much as 2, depending upon the slip speed of the converter pump and turbine.

A vacuum modulator is used to sense engine torque input to the transmission automatically. The vacuum modulator transmits this signal to the pressure regulator, which controls line pressure, so that all torque requirements of the transmission are met and proper shift spacing is obtained at all throttle openings.

The detent solenoid is activated by a switch at the carburetor. When the throttle is opened sufficiently to close this switch, the solenoid in the transmission is activated, causing a downshift at speeds below approximately 70 miles per hour. At lower speeds, downshifts will occur at lesser throttle openings without use of the switch.

The oil cooler is located in the right hand tank of the radiator, Fig. 7-2. The transmission is cooled by directing oil from the converter to the radiator. Oil returning from the radiator feeds the transmission lubrication system.

The oil system incorporates an intake pipe and strainer assembly. The strainer assembly should be replaced after the first 24,000 miles or two years, whichever occurs first. It should be replaced after the first 12,000 miles if heavy duty operation is encountered; such as constant use in heavy metropolitan traffic, pulling trailers, etc. In addition, replace strainer assembly when a major transmission failure occurs and flush the oil cooler and cooler lines. This is particularly important in the case of a converter failure.

The transmission quadrant has six selector positions, Fig. 7-3, that enable the driver to control the operation of the transmission under various driving conditions. The six selector positions appear on the quadrant in the following sequence, from left to right; P-park, R-reverse, N-neutral, DRIVE left, DRIVE right (intermediate) and L-lo.

P - Park position positively locks the output shaft to the transmission case by means of a locking pawl and prevents the vehicle from rolling either forward or backward. For this reason, it is recommended that the engine be started with transmission selector lever in Park position. If it is necessary to re-start the engine with the car rolling, place selector lever in Neutral.

R - Reverse enables the vehicle to be operated in a reverse direction.

N - Neutral position enables the engine to be started and run without driving the vehicle. It is recommended that Neutral be used to start the engine only if it is necessary to re-start the engine with the car rolling. At all other times use Park.

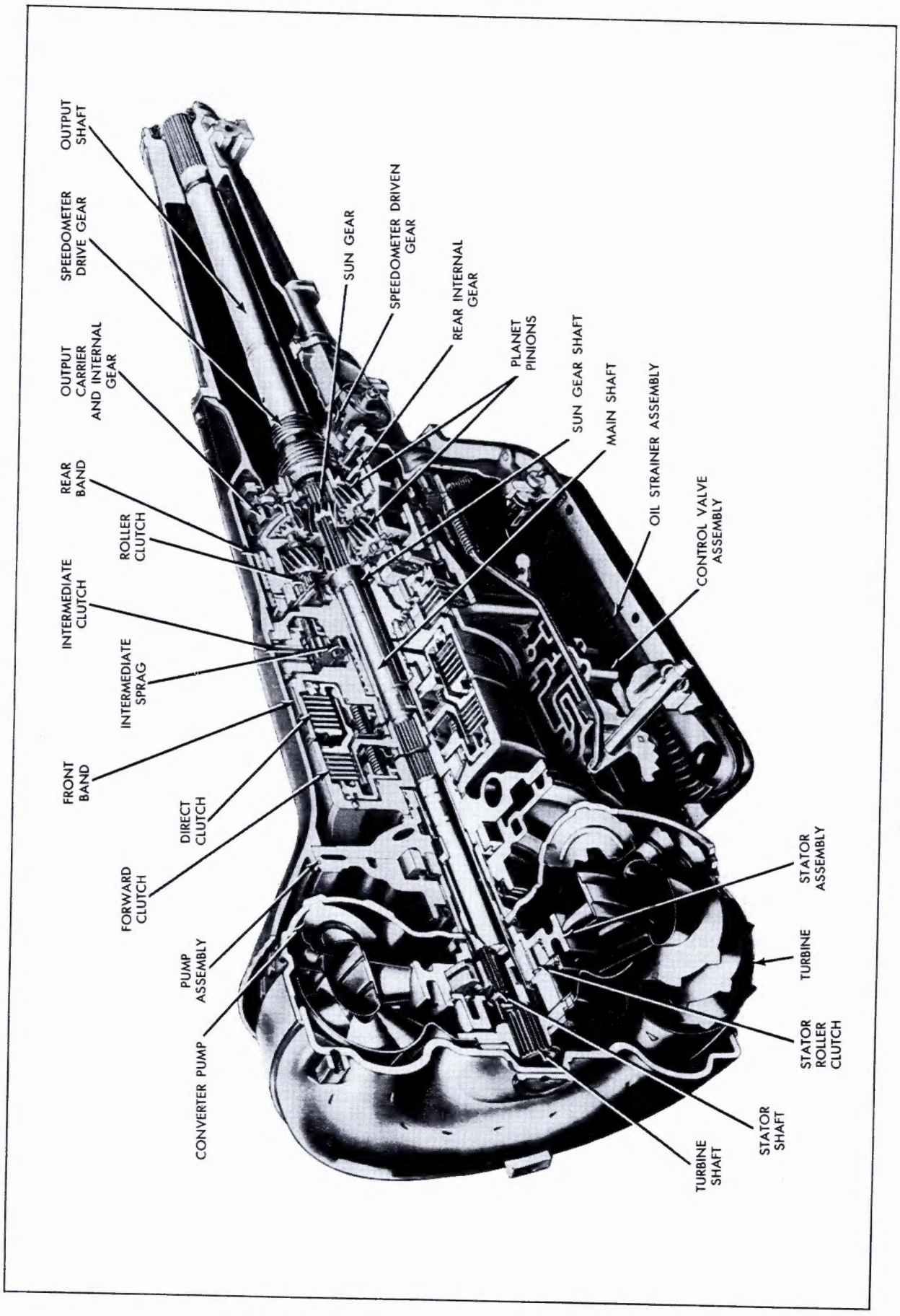


Fig. 7-1 Turbo Hydra-Matic Transmission Cutaway

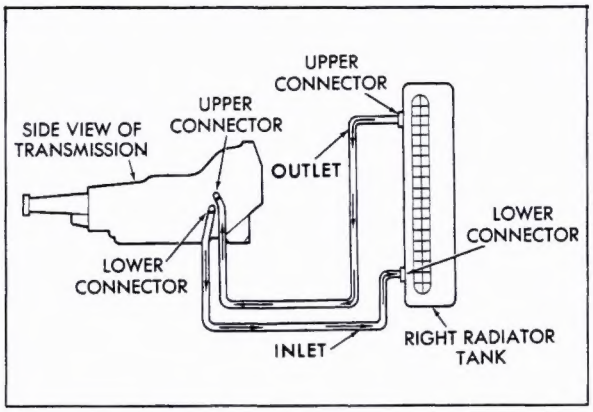


Fig. 7-2 Oil Cooler Lines

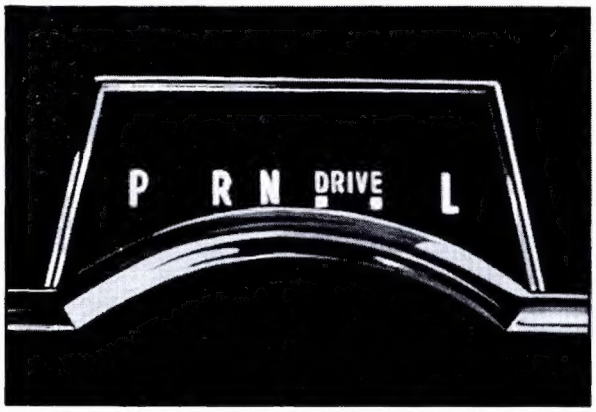


Fig. 7-3 Selector Quadrant

Drive (left) - Drive (left) is used for all normal driving conditions and maximum economy. Drive (left) has three gear ratios from starting to direct drive. Downshifts are available for safe passing, by depressing the accelerator pedal.

Drive (right) - Drive (right) adds performance for congested traffic or hilly terrain. This range has the same starting ratio as Drive (left), but prevents the transmission from shifting above second speed to retain acceleration when extra performance is desired. Engine braking is provided in this range.

L - Lo range permits operation at the lowest ratio, and should be used where only the lowest gear ratio is desired, such as in pulling a heavy load or descending a steep grade. When selector lever is moved from Drive to Lo range at normal highway speeds, the transmission will shift to second gear and remain in second gear until vehicle speed is reduced to approximately 45 mph. The transmission will then shift to first gear and remain in first gear regardless of vehicle or engine speed, until selector lever is moved back into either of the Drive positions.

HYDRAULIC SYSTEM DESCRIPTION

Pressure Control

The transmission is controlled automatically by a hydraulic system, Fig. 7-4. Hydraulic pressure is supplied by the transmission oil pump, which is engine driven. Main line pressure is controlled by a pressure regulator valve train located in the pump and by the vacuum modulator which is connected to engine vacuum. The pressure regulator controls the line pressure automatically, in response to a pressure signal from a modulator valve, in such a way that the torque requirements of the transmission clutches are met and proper shift spacing is obtained at all throttle openings.

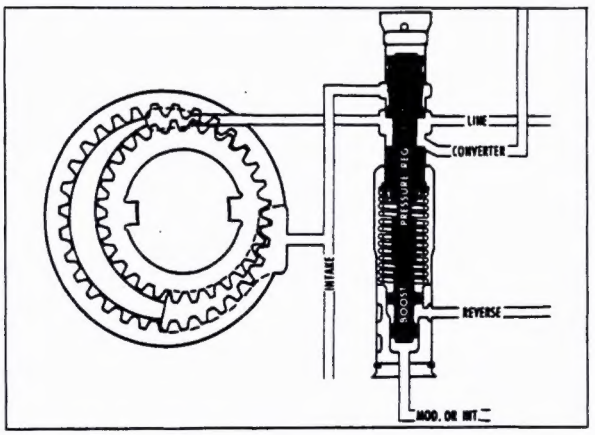


Fig. 7-4 Pressure Control

To control line pressure properly, a modulator pressure is used which varies in the same manner as torque input to the transmission. Since the torque input to the clutches is the product of engine torque and converter ratio, modulator pressure must compensate for changes in either or both of these.

To meet these requirements, modulator pressure is regulated by engine vacuum, which is an indicator of engine torque and carburetor opening. It will decrease with an increase in vehicle speed to compensate for the changing converter torque ratio, by virtue of the governor pressure influence.

Vacuum Modulator Assembly

The engine vacuum signal is received by the vacuum modulator, Fig. 7-5, which consists of an evacuated metal bellows, a diaphragm and two springs. These are so arranged that the bellows and external spring apply a force that acts on the modulator valve so that it increases modulator pressure. Engine vacuum and an internal spring oppose the bellows and spring to control modulator pressure.

To reduce the effect of altitude on shift points, the effective area of the diaphragm is different

than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.

Governor Assembly

The vehicle speed signal to the transmission is supplied by the governor, Fig. 7-6, which is driven by the output shaft. The governor consists of flyweights and a regulator valve. Centrifugal force of the flyweights is imposed on the regulator valve, causing it to regulate a pressure signal that increases with speed.

Governor pressure acts on the modulator valve to cause modulator pressure to decrease as vehicle speed increases.

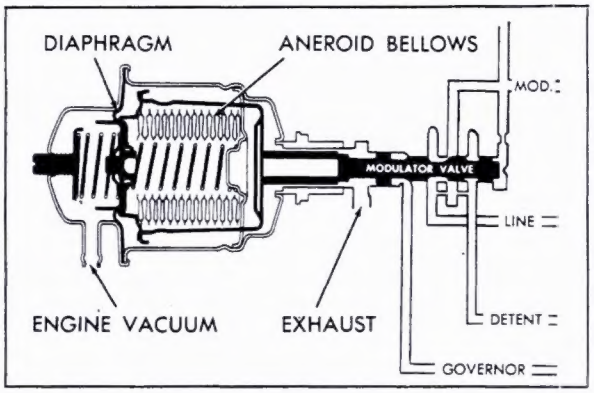


Fig. 7-5 Vacuum Modulator Assembly

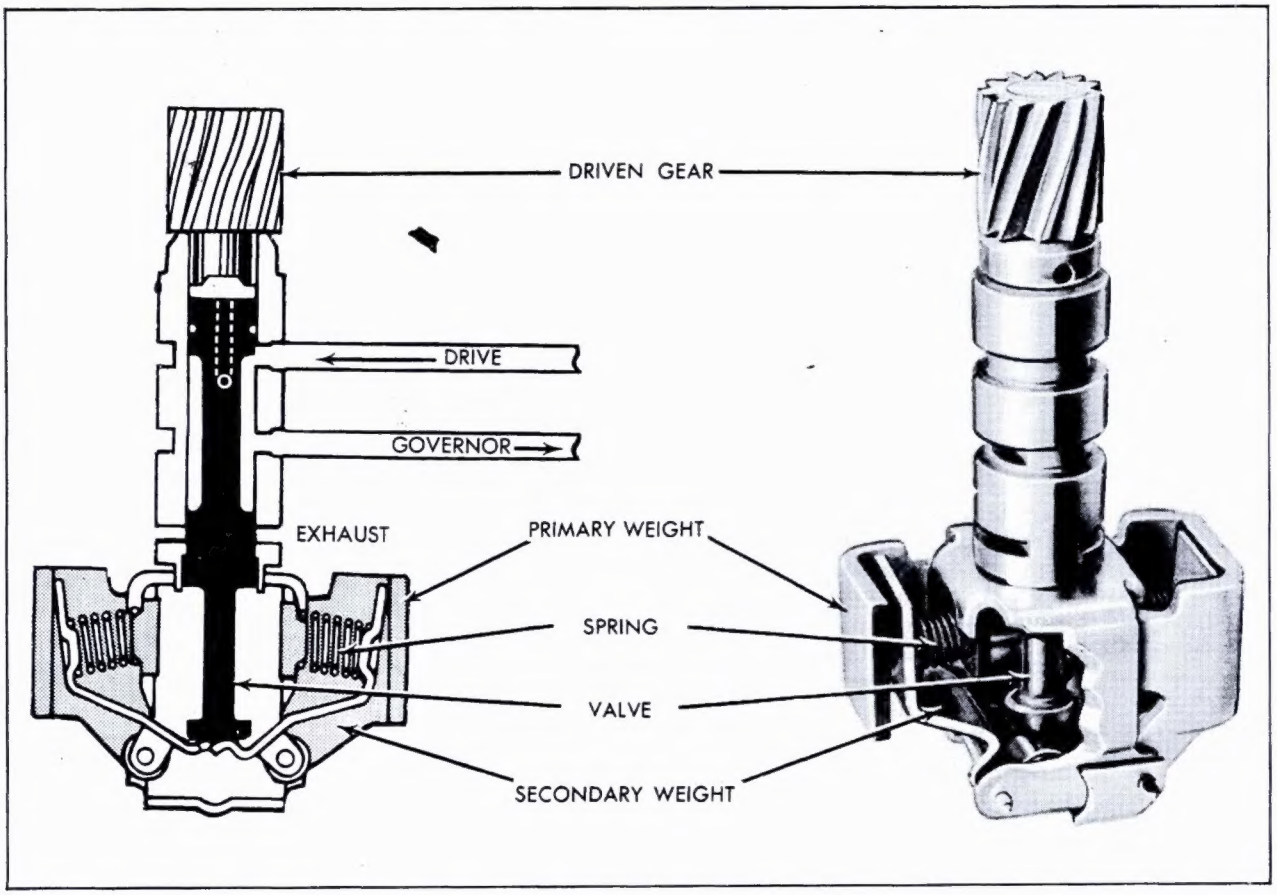


Fig. 7-6 Governor Assembly

FUNCTIONS OF VALVES AND HYDRAULIC CONTROL UNITS

Line Pressure Regulator

Regulates line pressure according to pump speed and engine torque.

Manual Valve

Establishes the range of transmission operation, P, R, N, DRIVE (left, right), L, as selected by the vehicle operator through the manual selector lever.

Governor Assembly

Generates a speed sensitive oil pressure that increases with output shaft or vehicle speed. Governor pressure is used to control the shift points and modulator pressure regulation.

Vacuum Modulator Valve

Provides modulator pressure that senses engine torque and vehicle speed. The vacuum modulator is used to vary the shift points according to throttle opening and to raise line pressure proportional to engine torque.

1-2 Shift Valve

Controls the speeds at which the 1-2 and 2-1 shifts occur.

1-2 Regulator Valve

Regulates modulator pressure to a proportional pressure, tending to keep 1-2 shift valve in downshift position.

1-2 Detent Valve

Senses regulated modulator pressure tending to hold 1-2 shift valve downshifted and provides an area for detent pressure for detent 2-1 shifts.

2-3 Shift Valve

Controls the speeds at which the 2-3 and 3-2 shifts occur.

2-3 Modulator Valve

Senses modulator pressure to apply a variable force that tends to hold the 2-3 shift valve downshifted.

3-2 Valve

Shuts off modulator pressure from acting on the shift valves after the direct clutch has been applied. This allows fairly heavy throttle operation in third speed without downshifting. In third speed, detent pressure or modulator pressure above 87 psi can be directed to the shift valves to provide the downshift forces.

1-2 Accumulator Valve

Regulates drive oil to a proportional lesser value that increases as modulator pressure increases, to control engagement of the intermediate clutch.

Detent Valve

Shifts when line oil is exhausted at the end of the valve when the detent solenoid is energized. This directs detent oil to the 1-2 and 2-3 modulator valves and allows the detent regulator valve to regulate.

Detent Regulator Valve

When the detent valve shifts, the detent regulator is freed to allow drive oil to enter the detent passage and thus becomes regulated at 70 psi. Detent pressures will also flow into the modulator passage which flows to the shift valves. Lo oil moves the detent regulator open to drive oil, allowing drive oil to enter the modulator and detent passages.

Rear Servo and Accumulator Assembly

The rear servo applies the rear band for engine braking in Lo Range 1st gear. It applies the band in Reverse to hold the reaction carrier to provide the reverse gear ratio.

On the 1-2 shift in Drive (left and right), it serves as an accumulator for the intermediate clutch to provide a smooth shift.

Front Servo

The front servo applies the front band to provide engine braking in 2nd gear in Drive (right) and Lo Ranges. It is also used as an accumulator for the apply of the direct clutch, and in conjunction with a series of check balls controlling orifices, is a part of the timing for the release of the direct clutch.

To prevent the apply of the front band in Neutral, Drive (left) and Reverse ranges, oil is directed from the manual valve to the release side of the servo piston.

In Drive (left) the servo release oil from the manual valve is used to charge the servo in preparation for the apply of the direct clutch.

Direct clutch oil is directed to the front servo accumulator piston where spring force plus direct clutch pressure stroke the piston up against the force of servo release oil. This lowers the clutch apply pressure for a smooth engagement.

The release of the direct clutch and the exhausting of the front servo accumulator is slowed down by three check balls and three orifices which permits a soft return of the drive load to the intermediate sprag and also allows engine rpm to increase during a detent 3-2 downshift in preparation for the lower gear ratio, which results in a smooth shift and better acceleration.

PARK OR NEUTRAL—ENGINE RUNNING POWER FLOW

Forward Clutch - Released

Roller Clutch - Ineffective

Direct Clutch - Released

Front Band - Released

Rear Band - Released

Intermediate Clutch - Released

Intermediate Sprag - Ineffective

In Neutral or Park no bands or clutches are applied, therefore no power is transmitted.

OIL FLOW (Fig. 7-7)

Whenever the engine is running at idle with the selector lever in "P" or "N", oil from the pump is directed to the:

1. Pressure Regulator Valve
2. Converter
   a. Oil Cooler
   b. Cooler By-Pass Valve
   c. Lubrication System
3. Manual Valve
4. Detent Valve
5. Detent Solenoid
6. Vacuum Modulator Valve
7. Front Servo (Neutral only)

Cooling and Lubrication

Oil flows from the pump to the pressure regulator valve which regulates pump pressure. When the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the converter feed passage to fill the converter. Oil from the converter is directed to the transmission cooler by-pass valve. Oil from the cooler is directed to the transmission lubrication system.

The cooler by-pass valve permits oil to be fed directly from the converter to lubrication circuits if the cooler becomes restricted. This by-pass is not included in service pumps.

Line pressure acts on the:

1. Manual Valve
2. Detent Valve
3. Detent Solenoid
4. Modulator Valve

Line pressure at the modulator valve is regulated to a pressure called modulator oil, which acts on the pressure boost valve, 1-2 accumulator valve and primary valves and passes through the detent valve and 3-2 valve to the 1-2 and 2-3 valve trains.

Summary

The converter is filled and all clutches and bands are released. The transmission is in Neutral.

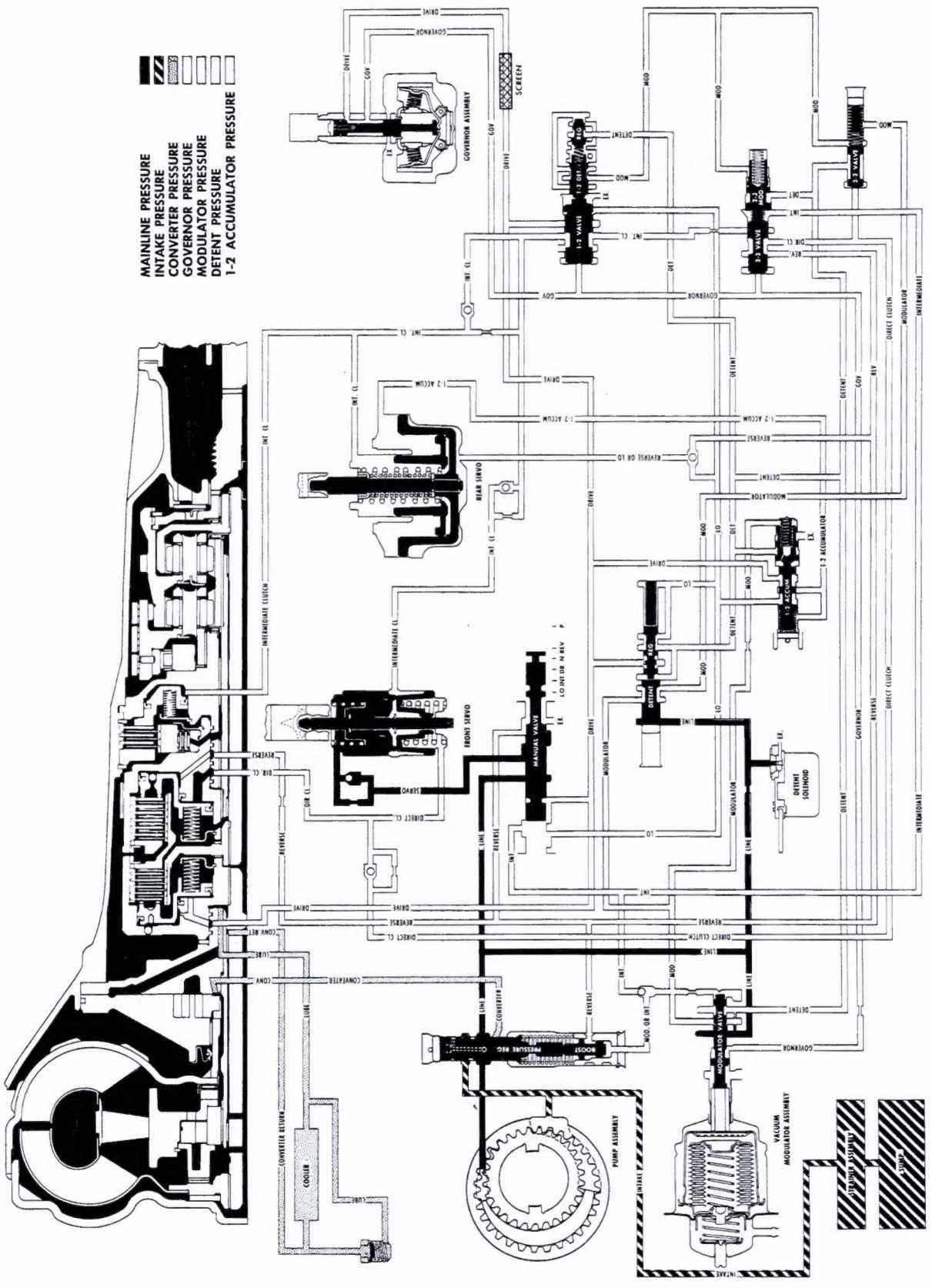


Fig. 7-7 Neutral - Engine Running

DRIVE LEFT AND RIGHT—FIRST SPEED POWER FLOW

Forward Clutch - Applied

Roller Clutch - Effective

Direct Clutch - Released

Front Band - Released

Rear Band - Released

Intermediate Clutch - Released

Intermediate Sprag - Ineffective

With the selector lever in either Drive Range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear in a clockwise direction. (Converter torque ratio = approximately 2:1 at stall.)

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear counterclockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.48:1. Reaction of the front pinions against the front internal gear is taken by reaction carrier and roller clutch assembly to the transmission case. (Approximate stall ratio - 5:1.)

OIL FLOW (Fig. 7-8)

When the selector lever is moved to either Drive position, the manual valve is repositioned to allow line pressure to enter the drive circuit. Drive oil then flows to the:

1. Forward Clutch
2. 1-2 Shift Valve
3. Governor Assembly
4. 1-2 Accumulator Valve
5. Detent Regulator Valve

Basic Control

Drive oil is directed to the forward clutch where it acts on two areas of the clutch piston to apply the forward clutch. The first, or inner area, is fed through an unrestricted passage. The outer area is fed through an orifice to insure a smooth shift into Drive.

Drive oil at the governor assembly is regulated to a variable pressure. This pressure increases the vehicle speed and acts against the ends of the 1-2 and 2-3 shift valves and an area on the modulator valve.

Drive oil is also regulated to another variable pressure at the 1-2 accumulator valve. This pressure is controlled by modulator oil and is directed to the rear servo. 1-2 accumulator oil at the rear servo acts on the accumulator piston. In addition, to maintain the lower pressure in the 1-2 accumulator passage, the 1-2 accumulator valve intermittently uncovers the lo oil passage and oil is exhausted at the manual valve.

Summary

The converter is filled. The forward clutch is applied. The transmission is in first gear.

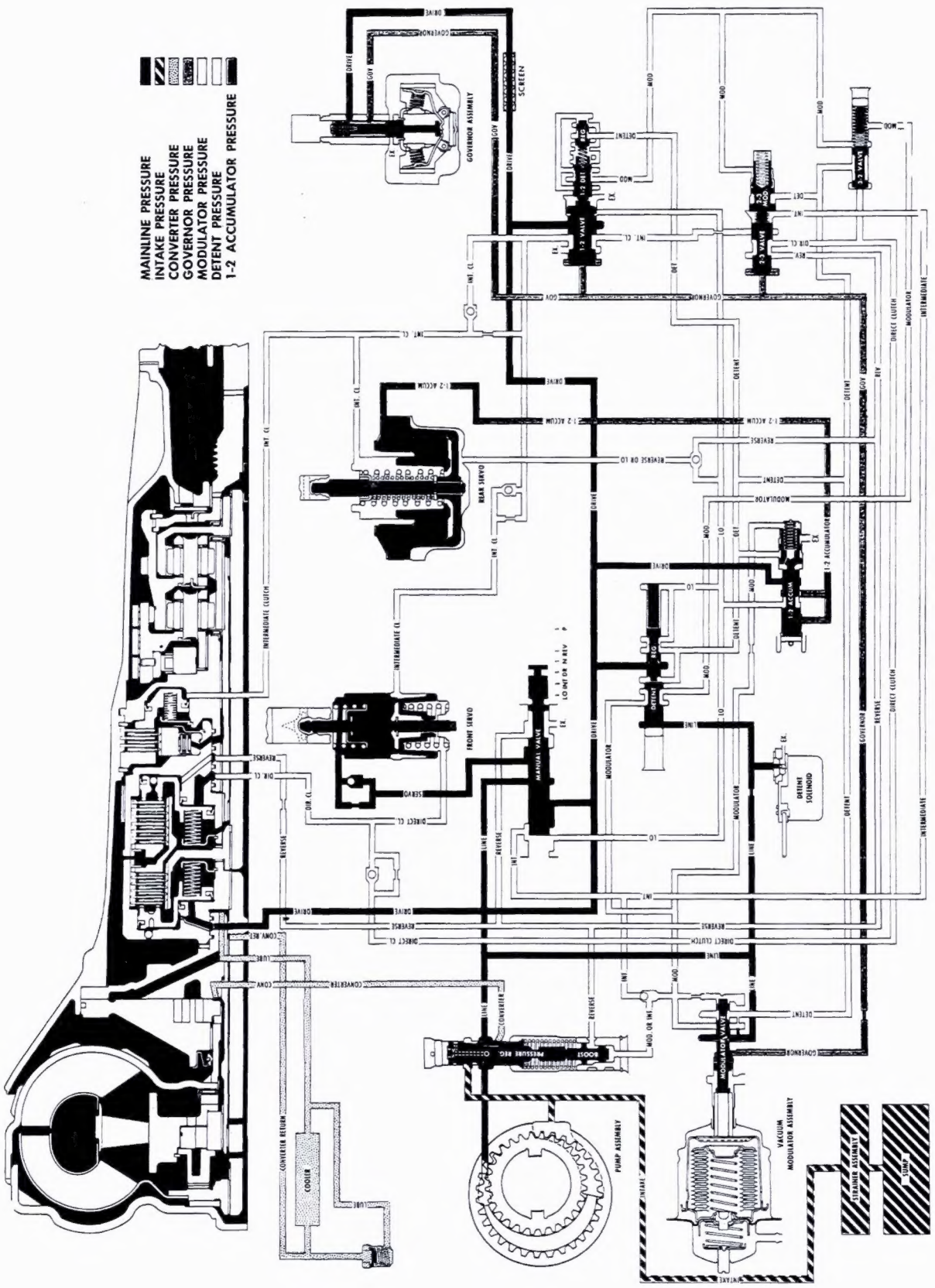


Fig. 7-8 Drive Range - First Gear

DRIVE (LEFT)—SECOND SPEED POWER FLOW

Forward Clutch - Applied

Roller Clutch - Ineffective

Direct Clutch - Released

Front Band - Released

Rear Band - Released

Intermediate Clutch - Applied

Intermediate Sprag - Effective

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.48:1.

NOTE: Further reduction is possible, at low speeds, due to the torque multiplication provided by the converter.

OIL FLOW (Fig. 7-9)

As both vehicle speed and governor pressure increase, the force of governor oil acting on the 1-2 shift valve will overcome the force of regulated modulator oil pressure. This allows the 1-2 shift valve to open, permitting drive oil to enter the intermediate clutch passage.

Intermediate clutch oil from the 1-2 shift valve is directed to the:

1. Intermediate Clutch
2. Rear Servo
3. Front Servo and Accumulator Pistons
4. 2-3 Shift Valve

Basic Control

Intermediate clutch oil from the 1-2 shift valve seats a one-way check ball and flows through an orifice to the intermediate clutch. At the same time, intermediate clutch oil moves the accumulator piston against the 1-2 accumulator oil and accumulator spring to maintain lower pressure in the clutch during a 1-2 shift for a smooth clutch apply. Intermediate clutch oil seats a second one-way check ball and flows to the front servo and accumulator pistons. Intermediate clutch oil is also directed to a land of the 2-3 shift valve.

Summary

The forward and intermediate clutches are applied. The transmission is in second speed.

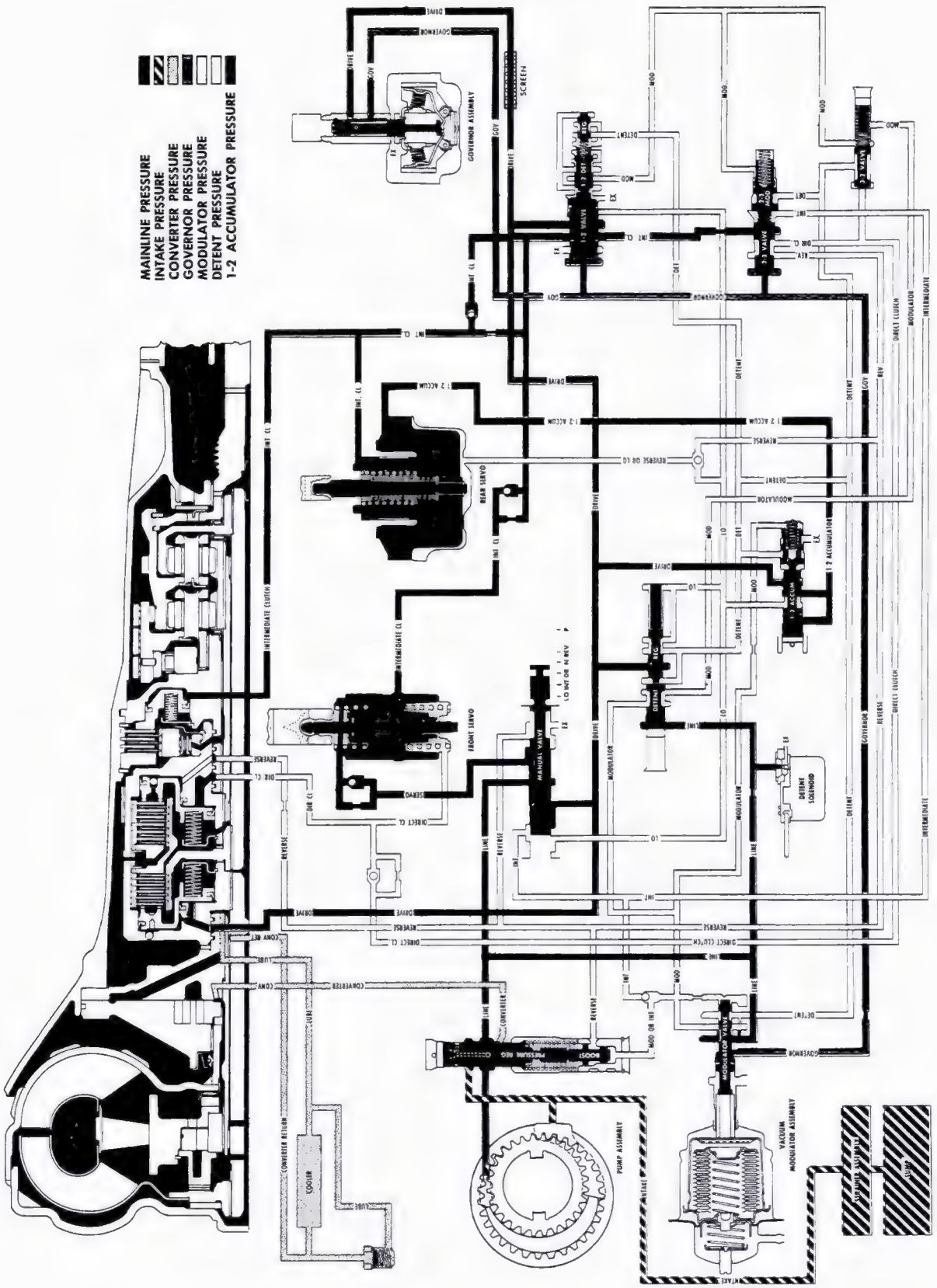


Fig. 7-9 Drive (Left) - Second Gear

DRIVE (LEFT)—THIRD SPEED POWER FLOW

Forward Clutch - Applied

Roller Clutch - Ineffective

Direct Clutch - Applied

Front Band - Released

Rear Band - Released

Intermediate Clutch - Applied

Intermediate Sprag - Ineffective

In direct drive, engine torque is transmitted from the converter, through the forward clutch to the mainshaft and rear internal gear. Because the direct clutch is applied, equal power is also transmitted to sun gear shaft and sun gear. Since both sun gear and internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive or a ratio of 1:1.

OIL FLOW (Fig. 7-10)

As vehicle speed and governor pressure increase, force of governor oil acting on the 2-3 shift valve overcomes the force of 2-3 shift valve spring and modulator oil. This allows the 2-3 shift valve to move, feeding intermediate clutch oil to the direct clutch passage.

Direct clutch oil from the 2-3 shift valve is directed to the:

1. Direct Clutch
2. Front Accumulator Piston
3. 3-2 Valve

Basic Control

Direct clutch oil from the 2-3 shift valve flows past a one-way check valve to the inner area of the direct clutch piston to apply the direct clutch. Simultaneously, direct clutch oil is fed to the front accumulator piston. Pressure of the direct clutch oil, combined with the accumulator spring, moves the accumulator and servo pistons against servo oil. This acts as an accumulator for a smooth direct clutch apply.

Direct clutch oil is also supplied to the 3-2 valve to move the valve against modulator pressure. This cuts off modulator oil to the 1-2 regulator and 2-3 modulator valves and allows the transmission to utilize the torque multiplying characteristics of the converter during medium throttle operation without downshifting.

Summary

The forward, intermediate and direct clutches are applied. The transmission is in third gear (direct drive).

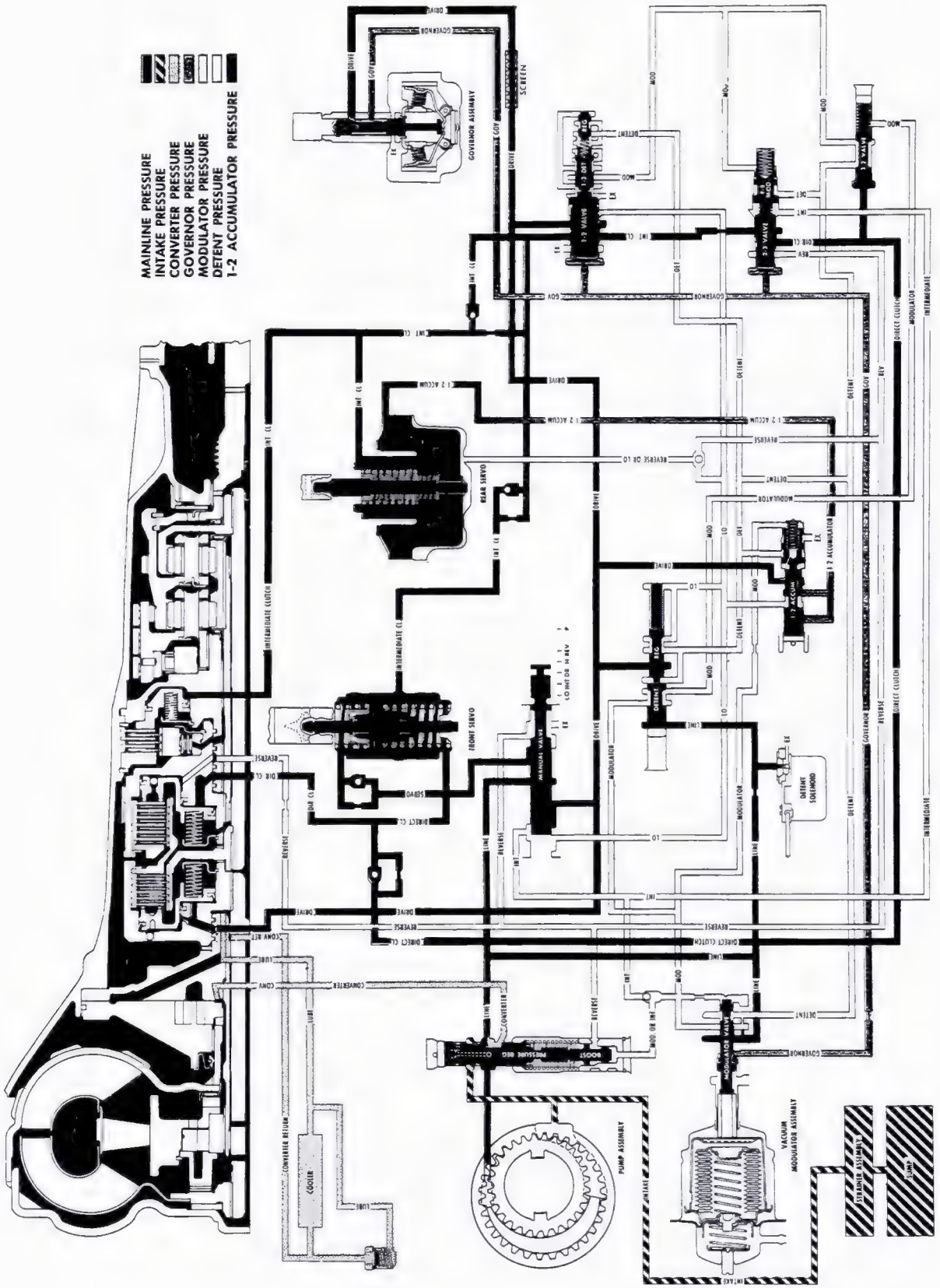


Fig. 7-10 Drive (Left) - Third Gear

PART THROTTLE 3-2 DOWNSHIFTS
POWER FLOW

Forward Clutch - Applied

Roller Clutch - Ineffective

Direct Clutch - Released in 2nd

Direct Clutch - Applied in 3rd

Front Band - Released

Rear Band - Released

Intermediate Clutch - Applied

Intermediate Sprag - Effective in 2nd

Intermediate Sprag - Ineffective in 3rd

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.48:1.

OIL FLOW (Fig. 7-11)

A part throttle 3-2 downshift can be accomplished below approximately 33 mph by depressing the accelerator far enough to raise modulator pressure to approximately 87 psi. Modulator pressure and the 3-2 valve spring will move the 3-2 valve against direct clutch oil and allow modulator oil to act on the 2-3 modulator valve. This moves the 2-3 valve train against governor oil and shifts the transmission to second speed.

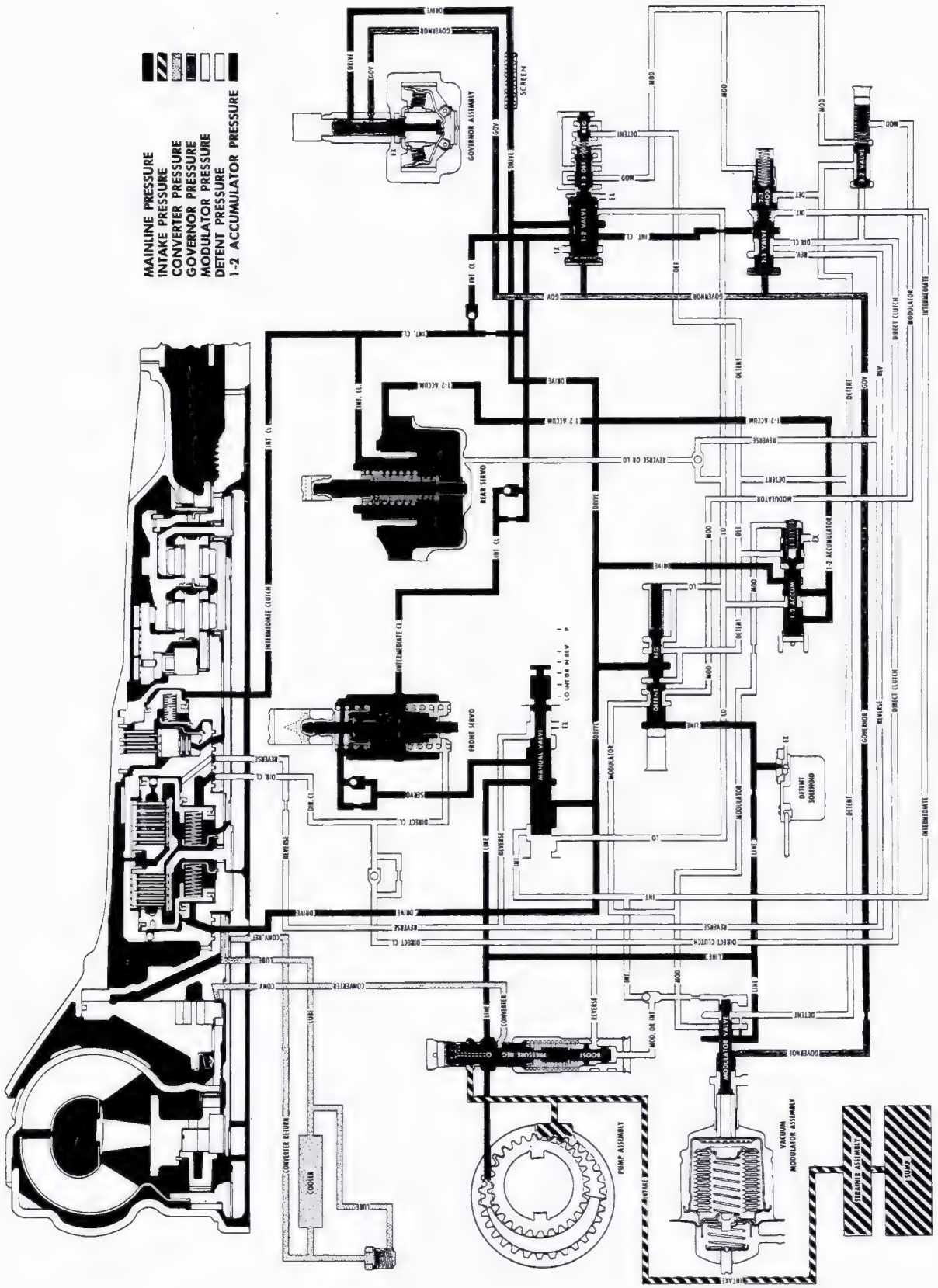


Fig. 7-11 Part Throttle 3-2 Downshift

DETENT 3-2 DOWNSHIFT POWER FLOW

Forward Clutch - Applied

Roller Clutch - Ineffective

Direct Clutch - Released in 2nd

Direct Clutch - Applied in 3rd

Front Band - Released

Rear Band - Released

Intermediate Clutch - Applied

Intermediate Sprag - Effective in 2nd

Intermediate Sprag - Ineffective in 3rd

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.48:1.

OIL FLOW (Fig. 7-12)

While operating at speeds below approximately 70 mph a forced or detent 3-2 downshift is possible by depressing the accelerator to 60° throttle opening. This energizes the switch at the carburetor and actuates the detent solenoid. The detent solenoid opens an orifice that allows line oil at the detent valve to be exhausted, thus permitting the detent regulator valve to operate. Line oil acting on the detent valve and solenoid is supplied by a small orifice.

Drive oil on the detent regulator valve is then regulated to a pressure of approximately 70 psi and called detent oil. Detent oil is then routed to the:

1. Modulator Passage
2. 1-2 Regulator Valve
3. 2-3 Modulator Valve
4. 3-2 Valve
5. 1-2 Primary Accumulator Valve
6. Vacuum Modulator Valve

Detent oil in the modulator passage and at the 2-3 modulator valve will close the 2-3 shift valve, shifting the transmission to second gear.

Detent 2-1 Downshift

A detent 2-1 downshift can also be accomplished below approximately 25 mph because detent oil is directed to the 1-2 regulator valve. This allows detent oil to act on the 1-2 regulator, and 1-2 detent valve to close the 1-2 shift valve, shifting the transmission to first gear.

Detent oil is also directed to the modulator valve to prevent modulator pressure from regulating below 70 psi at high speeds or at high altitudes.

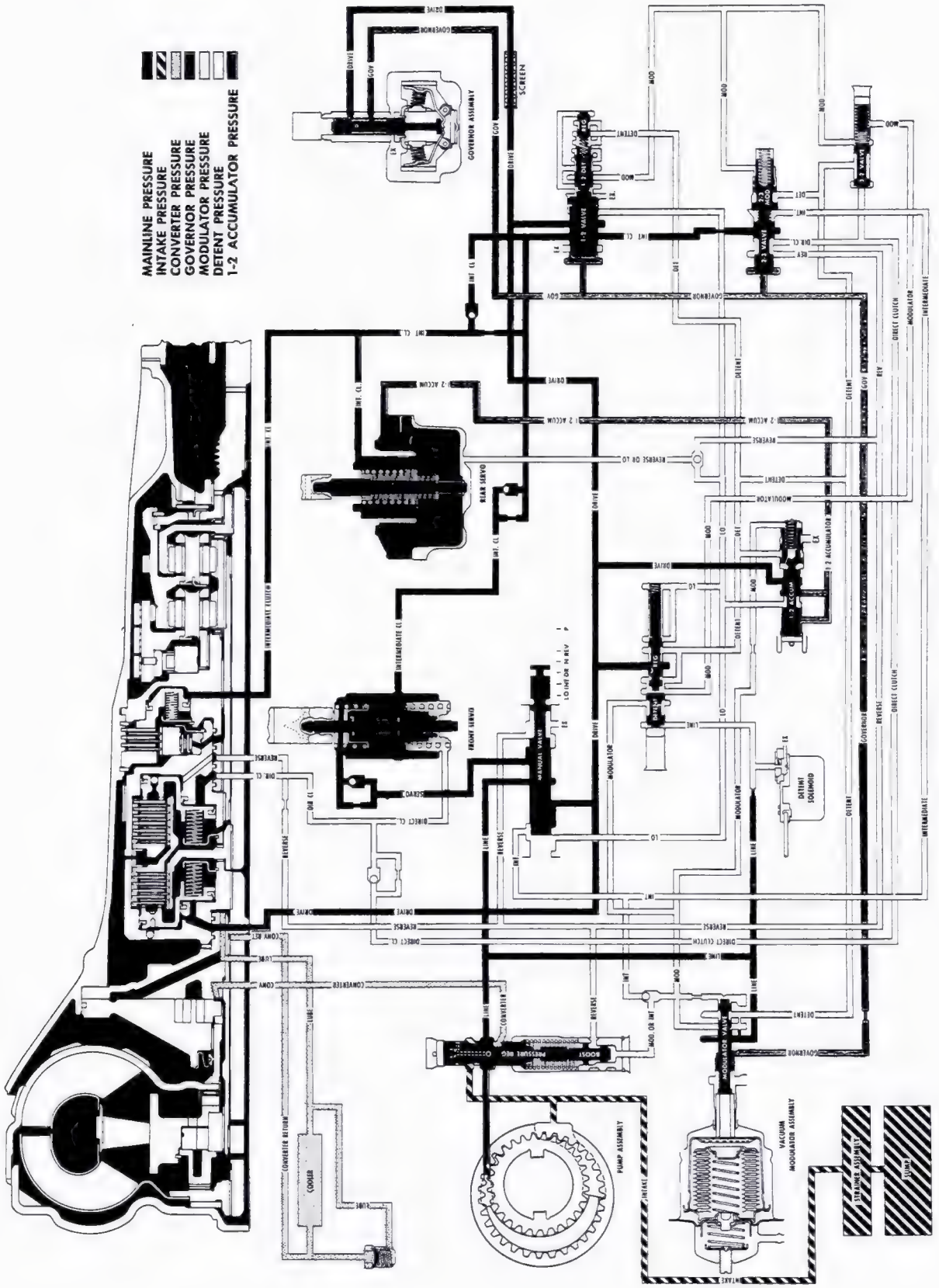


Fig. 7-12 Detent 3-2 Downshift

DRIVE (RIGHT)—SECOND SPEED POWER FLOW

Forward Clutch - Applied

Roller Clutch - Ineffective

Direct Clutch - Released

Front Band - Applied

Rear Band - Released

Intermediate Clutch - Applied

Intermediate Sprag - Effective

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against counterclockwise rotation. Turbine torque through the forward clutch is now applied through the mainshaft to the rear internal gear in a clockwise direction.

Clockwise rotation of the rear internal gear turns the rear pinions clockwise against the stationary sun gear. This causes the output carrier and output shaft to turn clockwise in a reduction ratio of approximately 1.48:1.

In second speed - Drive (right), engine braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate sprag.

OIL FLOW (Fig. 7-13)

When the selector lever is in Drive (right), intermediate oil from the manual valve is directed to the:

1. Pressure Boost Valve
2. 2-3 Shift Valve

Intermediate oil at the boost valve will increase line pressure to 150 psi. This increased intermediate oil pressure at the 2-3 shift valve will close the 2-3 shift valve, regardless of car speed.

For engine braking the front band is applied by exhausting servo oil at the manual valve. This allows intermediate clutch oil, acting on the servo piston, to move the piston and apply the front band. Once the transmission is in second speed - Drive (right), it cannot upshift to third gear.

Summary

The forward and intermediate clutches and front band are applied. The transmission is in second gear - Drive (right).

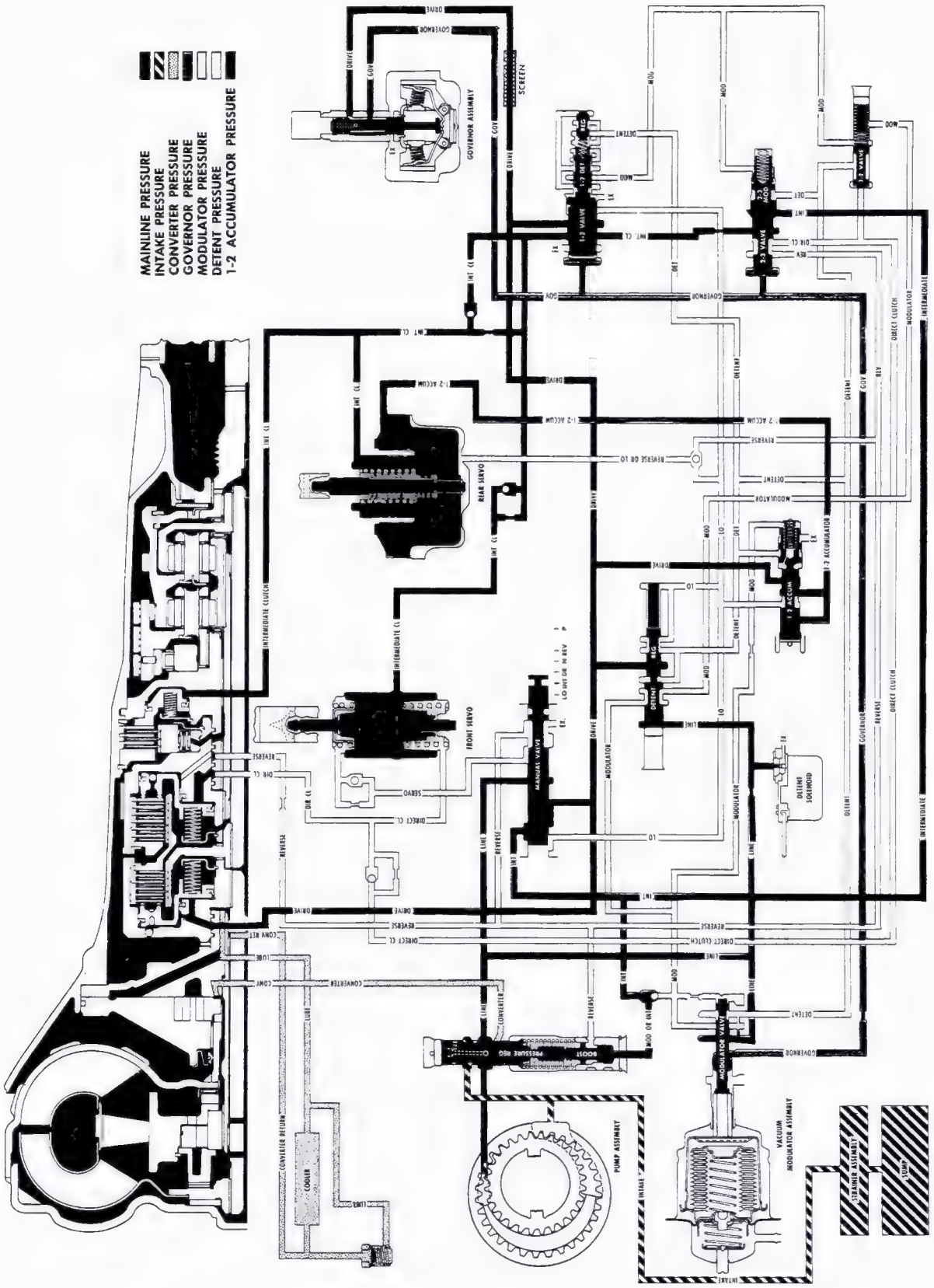


Fig. 7-13 Drive (Right) - Second Gear

LO RANGE—FIRST SPEED POWER FLOW

Forward Clutch - Applied

Roller Clutch - Effective

Direct Clutch - Released

Front Band - Released

Rear Band - Applied

Intermediate Clutch - Released

Intermediate Sprag - Ineffective

With the selector lever in Lo range, the forward clutch is applied. This delivers turbine torque to the mainshaft and turns the rear internal gear in a clockwise direction. (Converter torque ratio = approximately 2.00:1 at stall.)

Clockwise motion of the rear internal gear causes the rear pinions to turn clockwise to drive the sun gear counterclockwise. In turn, the sun gear drives the front pinions clockwise, thus turning the front internal gear, output carrier, and output shaft clockwise in a reduction ratio of approximately 2.48:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Total stall ratio = approximately 5.00:1.)

Downhill or overrun braking is provided in Lo range by applying the rear band, as this prevents the reaction carrier from overrunning the roller clutch.

OIL FLOW (Fig. 7-14)

Maximum downhill braking can be attained at speeds below 40 mph, with the selector lever in Lo position as this directs Lo oil from the manual valve to the:

1. Rear Servo
2. 1-2 Accumulator Valve
3. Detent Regulator Valve
4. 1-2 Shift Valve

Basic Control

Lo oil flows past a ball check to the apply side of the rear servo piston and to the 1-2 accumulator valve to raise the 1-2 accumulator oil to line pressure for a smooth band apply.

Lo oil acts on the detent regulator valve. Combined with the detent spring, Lo oil holds the detent valve against line oil acting on the detent valve, causing drive oil to flow through the detent regulator valve into the detent and modulator passages. Modulator and detent oil at line pressure acting on the 1-2 regulator and 1-2 detent valve overcomes governor oil and LO oil on the 1-2 shift valve at any vehicle speed below approximately 40 mph, and the transmission will shift to first gear.

In first speed - Lo range, the transmission cannot upshift to second speed regardless of vehicle or engine speed.

Summary

The forward clutch and rear band are applied. The transmission is in first speed - Lo range.

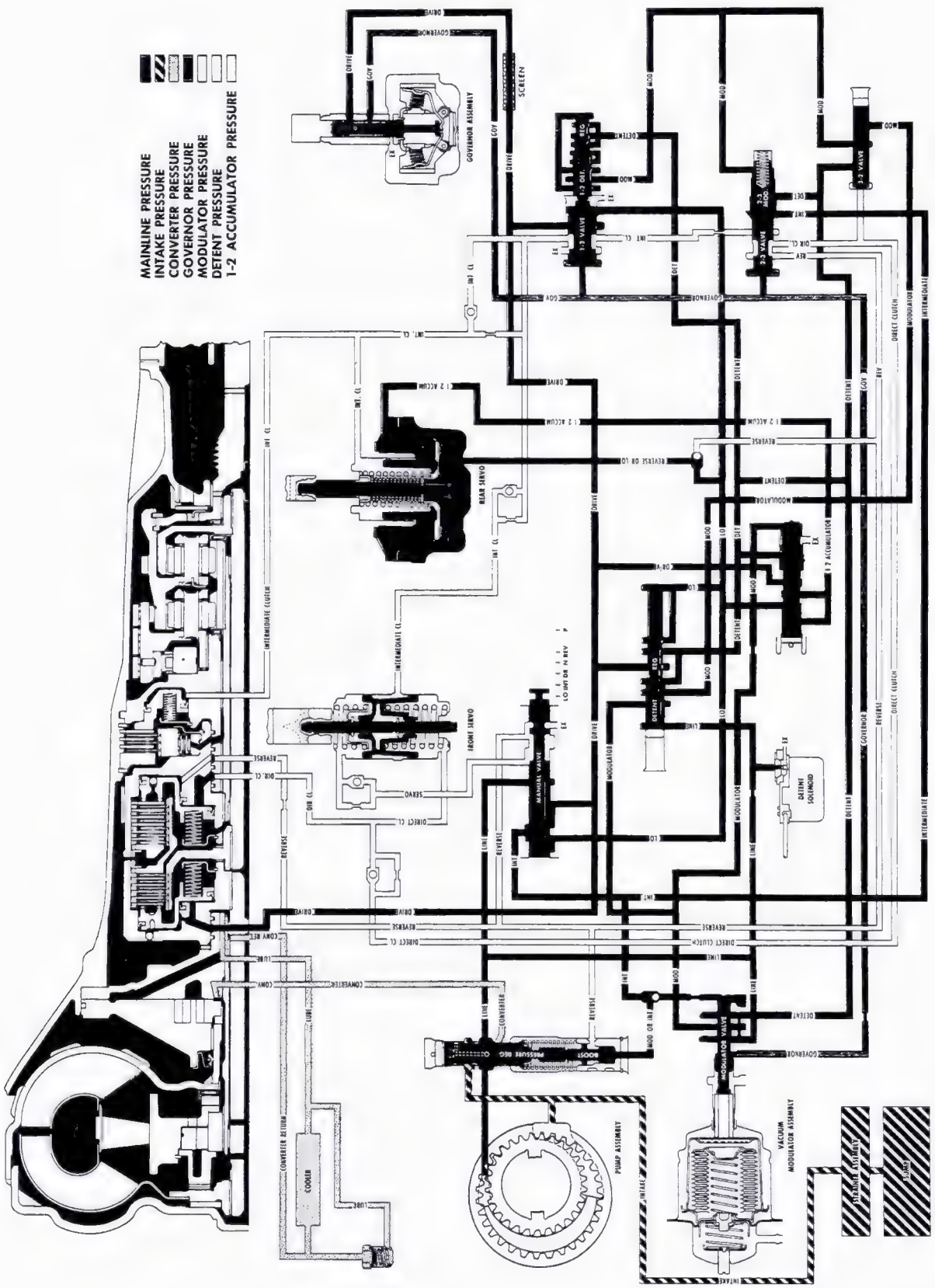


Fig. 7-14 Lo Range - First Gear

REVERSE
POWER FLOW

Forward Clutch - Released

Roller Clutch - Ineffective

Direct Clutch - Applied

Front Band - Released

Rear Band - Applied

Intermediate Clutch - Released

Intermediate Sprag - Ineffective

In Reverse, the direct clutch is applied to direct turbine torque to the sun gear shaft and sun gear. The rear band is also applied, holding the reaction carrier.

Clockwise torque to the sun gear causes the front pinions and front internal gear to turn counterclockwise in reduction. The front internal gear is connected directly to the output shaft, thus providing the reverse output gear ratio of approximately 2.08:1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4.00:1.

OIL FLOW (Fig. 7-15)

When the selector lever is moved to the Reverse position, the manual valve is repositioned to allow line pressure to enter the reverse circuit. Reverse oil then flows to the:

1. Direct Clutch
2. 2-3 Shift Valve
3. Rear Servo Piston
4. Pressure Boost Valve

Basic Control

Reverse oil from the manual valve flows to the large area of the direct clutch piston and to the 2-3 shift valve. From the 2-3 shift valve, it enters the direct clutch passage and is directed to the small area of the direct clutch piston to apply direct clutch.

Reverse oil flows to the rear servo and acts on the servo piston to apply the rear band. Reverse oil also acts on the pressure boost valve to boost line pressure.

Summary

The direct clutch and the rear band are applied. The transmission is in Reverse.

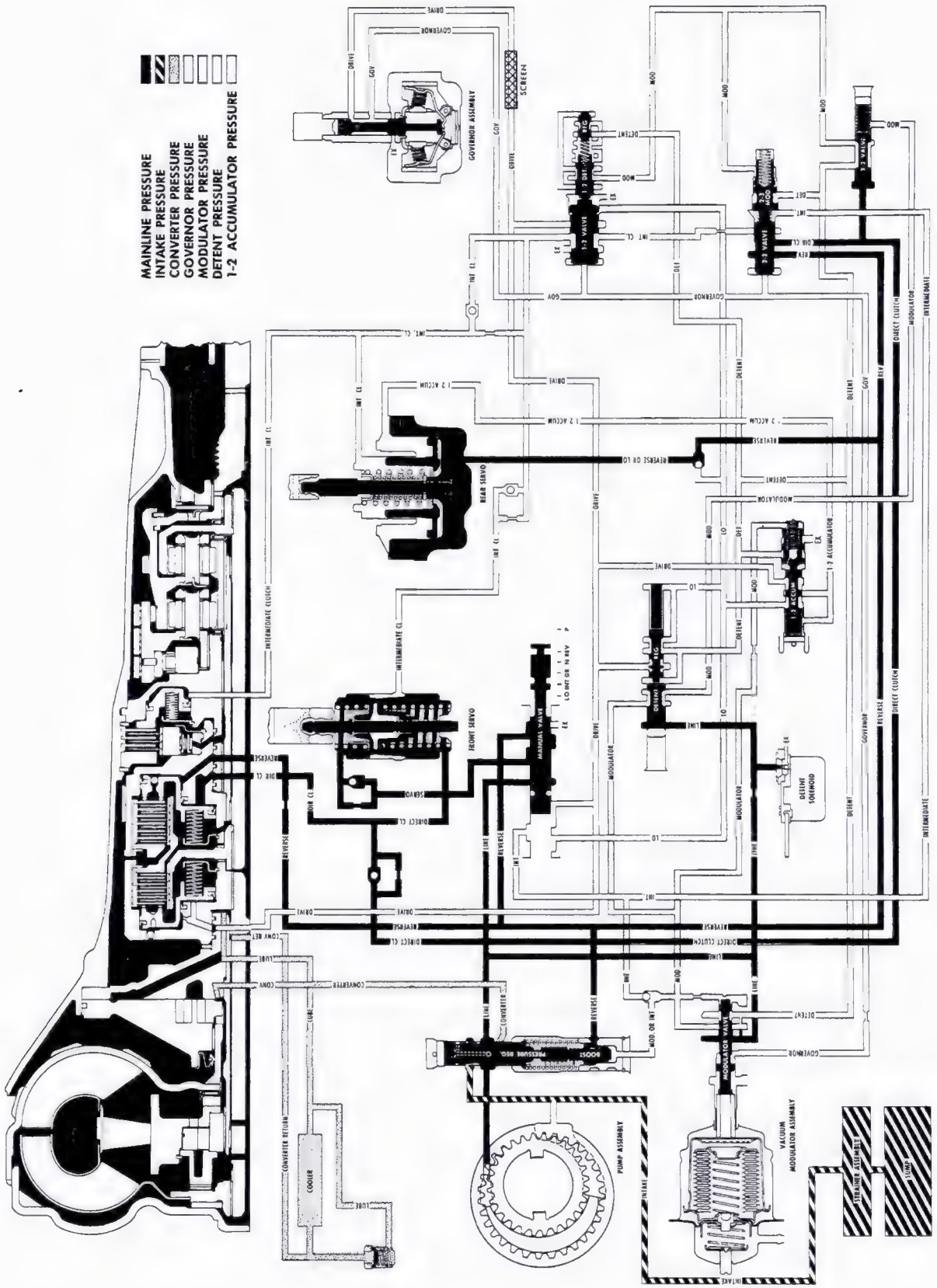
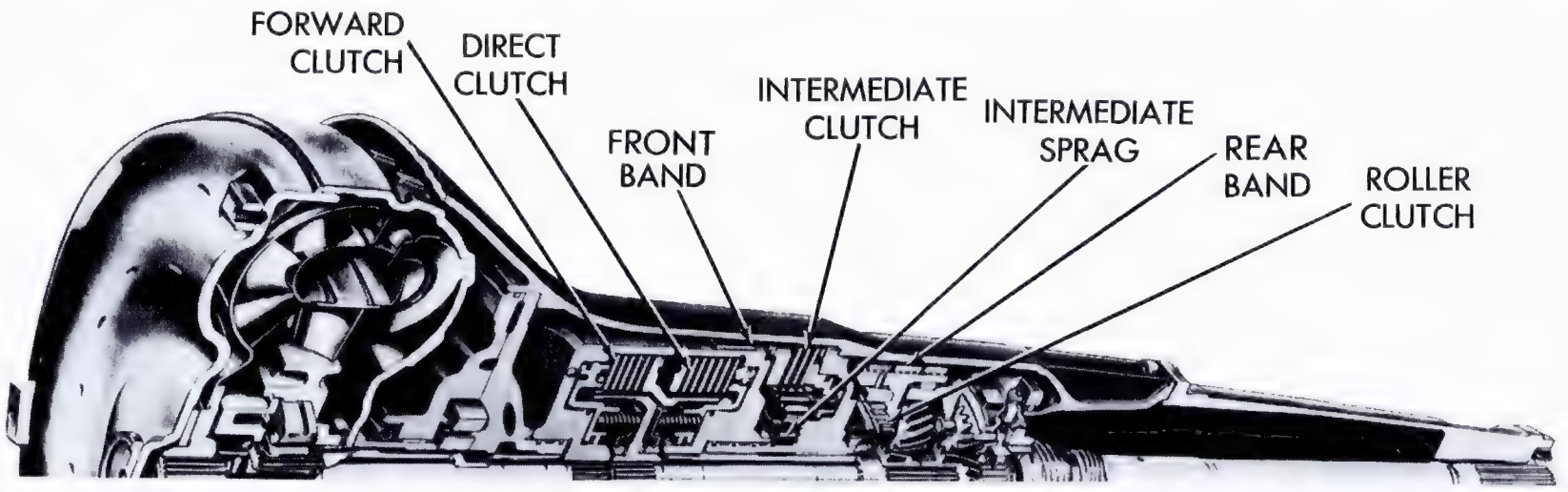


Fig. 7-15 Reverse



SELECTOR POSITION	PUMP PRESSURE	FORWARD CLUTCH	DIRECT CLUTCH	FRONT BAND	INT. CLUTCH	INT. SPRAG	ROLLER CLUTCH	REAR BAND
PARK—NEUT.	60-150	OFF	OFF	OFF	OFF	OFF	OFF	OFF
DRIVE 1	60-150	ON	OFF	OFF	OFF	OFF	ON	OFF
LEFT 2	60-150	ON	OFF	OFF	ON	ON	OFF	OFF
3	60-150	ON	ON	OFF	ON	OFF	OFF	OFF
DRIVE 1	150	ON	OFF	OFF	OFF	OFF	ON	OFF
RIGHT 2	150	ON	OFF	ON	ON	ON	OFF	OFF
LO 1	150	ON	OFF	OFF	OFF	OFF	ON	ON
2	150	ON	OFF	ON	ON	ON	OFF	OFF
REV.	95-240	OFF	ON	OFF	OFF	OFF	OFF	ON

Fig. 7-16 Band, Sprag and Clutch Application Chart

1. Service Information

NOTE: The following information, unless specifically noted elsewhere, is not applicable to the Fleetwood Eldorado.

CAUTION: In the event of a major transmission failure, replace strainer assembly, flush oil cooler and lines. This is particularly important in the case of a converter failure.

a. How to Use This Diagnosis Guide

This Diagnosis Guide should be used in the following sequence to positively locate the problem:

1. Perform the "Preliminary Checking Procedure" in Part b, recording the readings in the Oil Pressure Reading row. After taking the pressure readings, place Low, Normal or High in each box of the Oil Pressure Pattern row.
2. Road test the car as described in Part c, if problem is not known.
3. Refer to the "Transmission Malfunction Related to Oil Pressure" chart in Part d. First, determine if malfunction noted is in this chart. If so, compare Oil Pressure Pattern row in Part b with Part d. A dash on the "Transmission Malfunction Related to Oil Pressure" chart means that the oil pressure reading has no significance under that test condition.

If transmission malfunction is found in this chart, follow the directions indicated in the Malfunction column. The oil pressure pattern will indicate where the malfunction is.

The only time it is necessary to determine a pressure drop (the control valve assembly-governor line pressure check, part m) is when there is "No 1-2 Upshift and/or Delayed Upshift" and all oil pressure readings are normal.

It will not be necessary to repeat oil pressure readings taken during preliminary checks should this be called for during further tests.

4. If malfunction cannot be determined by the chart in Part d, or if upon completion of these tests, it is not found, see the "Transmission Troubleshooting Guide", in Part e, to locate malfunction not related to oil pressure.

All malfunctions, both those related to oil pressure and those that are not, are listed in the "Transmission Troubleshooting Guide". Always perform the "Preliminary Checking Procedure" first as it provides a positive means to isolate the problem if the malfunction can be diagnosed by this procedure.

5. After correcting malfunction, road test car as described in Part c.

NOTE: This information pertains to all Cadillac transmissions. For additional illustrations on the Fleetwood Eldorado transmission, see the later portion of this section.

b. Preliminary Checking Procedure

(See page 7-26, Fig. 7-17).

c. Transmission Road Testing

1. Connect portable tachometer to engine. Engine rpm will identify shift points.
2. Place selector in "Drive Left" position and accelerate the vehicle from rest at a minimum throttle opening. The specifications for shift points are:

Upshift	All
1-2	6-12 mph
2-3	17-25 mph

Accelerate the vehicle from rest at wide-open throttle. The specifications for shift points are:

Upshift	Except 693	693 Style
1-2	37-53 mph	37-50 mph
2-3	68-88 mph	65-85 mph
(Detent Downshifts)		
3-2	65-75 mph	62-72 mph
2-1	15-28 mph	15-25 mph

Downshifts should occur (3-2 and 2-1) as the vehicle speed decreases to 0 mph. Stop car.

3. Place selector in "Drive Right" position and accelerate the vehicle from rest. A 1-2 shift should occur at all throttle openings. No 2-3 shift can be obtained in this range. Stop car.
4. Place selector in "Low". No upshift should occur in this range regardless of the throttle opening.
5. Position the selector in "Drive Left" and accelerate the vehicle to 35 mph and move the selector to "Drive Right". A 3-2 downshift should occur, increasing the engine rpm and an engine braking effect should be noticed on deceleration.
6. With the selector in "Drive Right" at approximately 25 mph, but not over 40 mph, at closed throttle, move the selector to "Low". A 2-1 downshift should occur, increasing the engine rpm and an engine braking effect should be noticed on deceleration. Stop car.
7. Place selector in "Reverse" and check for reverse operation.

b. Preliminary Checking Procedure

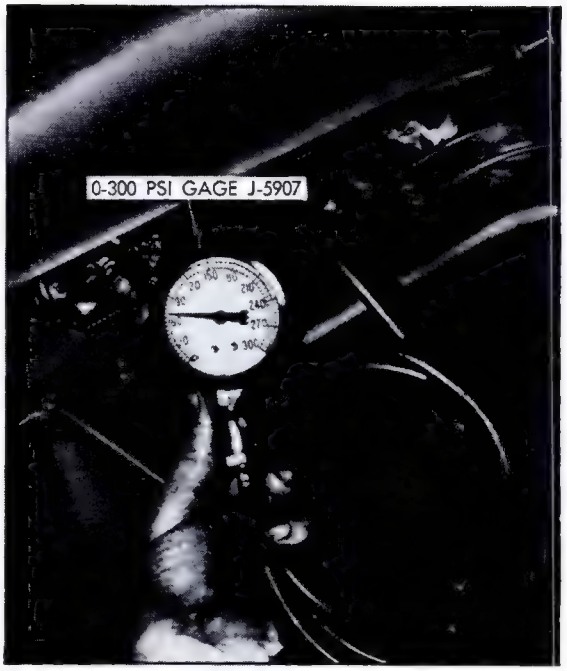
CHECK TRANSMISSION OIL LEVEL SEE NOTE 2 or 25.

CHECK MANUAL LINKAGE AND CORRECT. SEE NOTE 4 or 22.

INSTALL OIL PRESSURE GAGE

CHECK OIL PRESSURE IN FOLLOWING MANNER

CAUTION - Total Running Time for This Combination Not to Exceed 2 Minutes



Range	Drive (Left) Brakes Applied Engine at 1000 RPM	Drive-R Brakes Applied Engine at 1000 RPM	Reverse Brakes Applied Engine at 1000 RPM	Neutral Brakes Applied Engine at 1000 RPM	Drive Idle Set Engine Idle to Specifications	*Drive 30 MPH Closed Throttle
Oil Pressure Reading						
Normal P.S.I.	60 to 90	135 to 160	95 to 150	55 to 70	60 to 85	55 to 70
Oil Pressure Pattern - Low, Normal or High						

*The following alternate check may be used to obtain this pressure reading and permit all the required pressure checks to be made without the necessity of a road test.

1. Vehicle on hoist - driving wheels off ground, foot off brake, in Drive Range.
2. Engine 2000 RPM.
3. Close throttle (foot off accelerator) and take pressure reading engine 2000 - 1200 RPM.

NOTE: With closed throttle and driving wheels off the ground, engine RPM will drop rapidly. Pressure reading must be taken within RPM's indicated and with closed throttle.

Fig. 7-17 Preliminary Checking Procedure Chart

Malfunction	Drive (Left) Brakes Applied 1000 RPM	Drive-R Brakes Applied 1000 RPM	Reverse Brakes Applied 1000 RPM	Neutral Brakes Applied 1000 RPM	Drive Idle	Drive 30 MPH Closed Throttle or Alternate Check	Pressure Drop Occurs While Engine RPM Increases From 1000 to 3000 RPM Wheels Free To Move	Possible Cause of Malfunction
	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure	Oil Pressure		
No 1-2 Upshift and/or Delayed Upshift Compare Preliminary Pressure Reading and See Part f.	Normal	Normal	Normal	Normal	Normal	Normal	Drop	Malfunction in Control Valve Assy.
	Normal	Normal	Normal	Normal	Normal	Normal	No Drop	Malfunction in Governor or Governor Feed System
	High	Normal	Normal	Normal	-	High	-	Malfunction in Detent System
	High	Normal	High	High	-	-	-	Malfunction in Modulator or Vacuum Feed System to Modulator
Slipping-Reverse See Trouble-shooting Guide	Normal	Normal	Low	Normal	-	Normal	-	Oil Leak in Feed System to the Direct Clutch
Slipping-1st Gear. See Trouble-shooting Guide	Low	Low to Normal	Normal	Low to Normal	-	Low to Normal	-	Oil Leak in Feed System to the Forward Clutch
*Downshift with Zero Throttle and No Engine Braking in Drive	** Normal	Normal	Normal	Normal	High	High	-	Stator and Detent Wires switched

*Applicable only to variable stator transmissions, not to any 1968 or 1969 model.
**1966 Cadillac with Brakes Applied will show High if Wires are Switched.

Fig. 7-18 Malfunction to Oil Pressure Chart

e. No 1-2 Upshift and/or Delayed Upshift

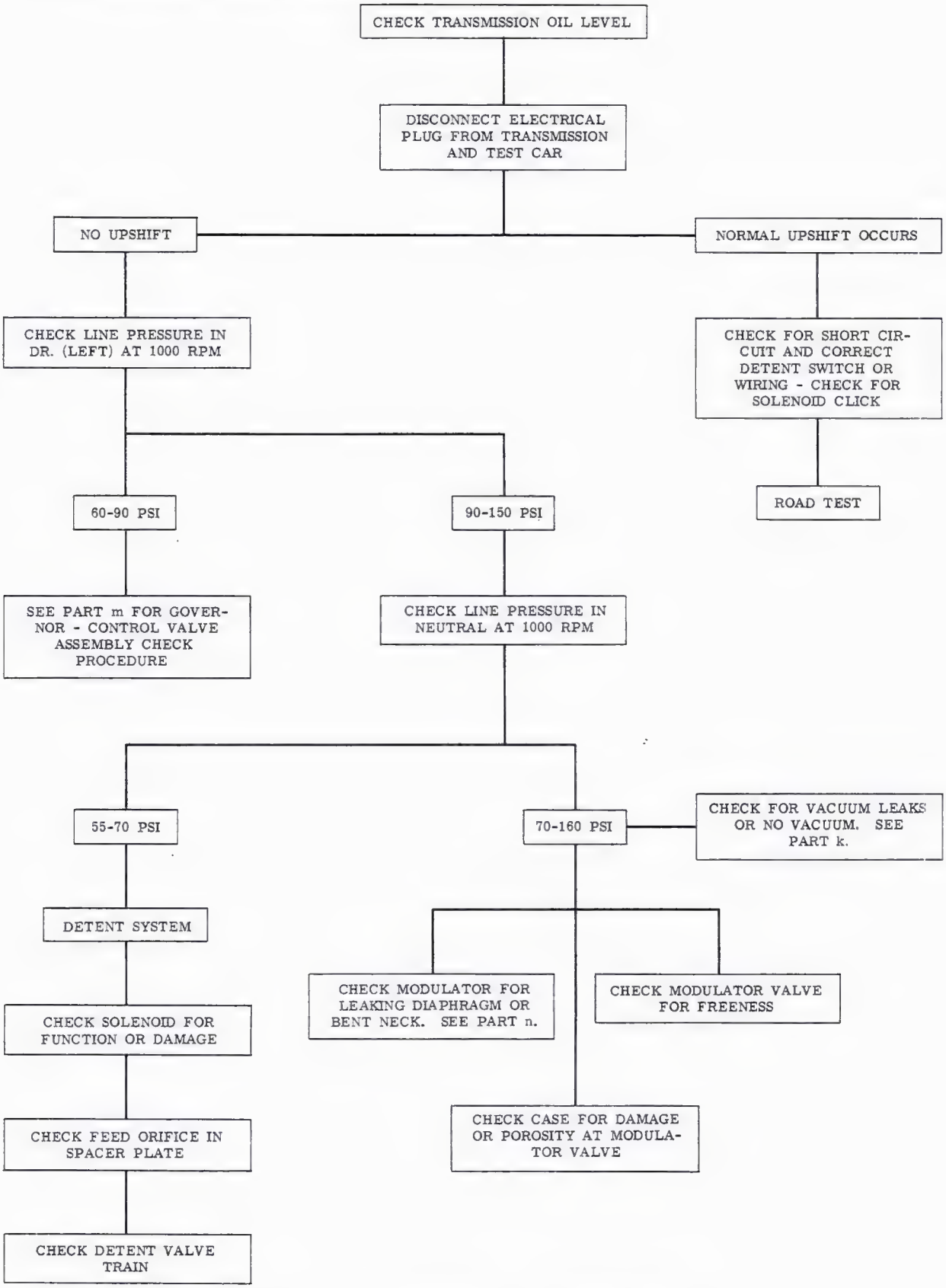


Fig. 7-19 No. 1-2 Upshift and/or Delayed Upshift Chart

f. 1-2 Shift Feel Complaint

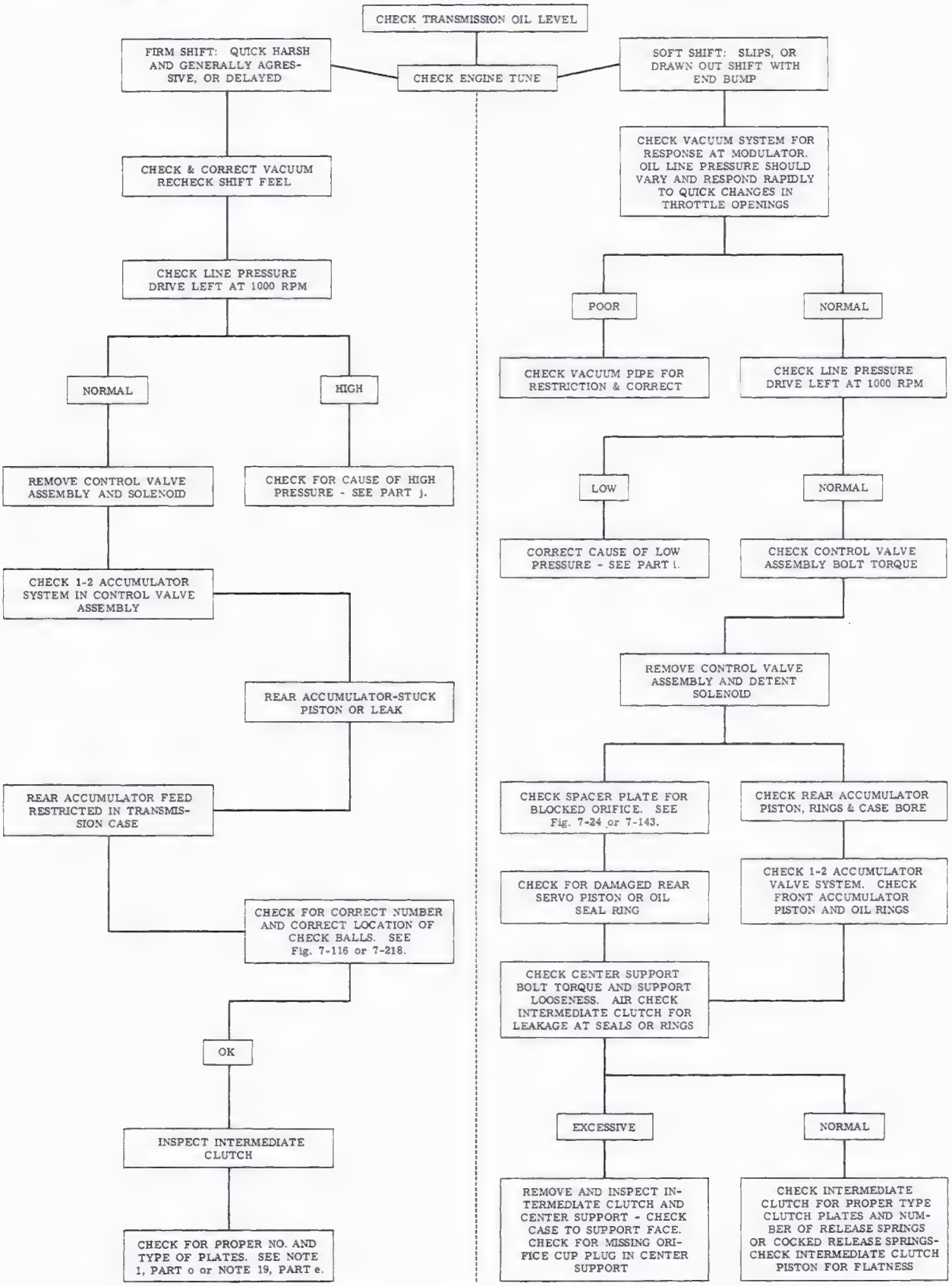


Fig. 7-20 1-2 Shift Feel Complaint Chart

g. 2-3 Shift Complaint

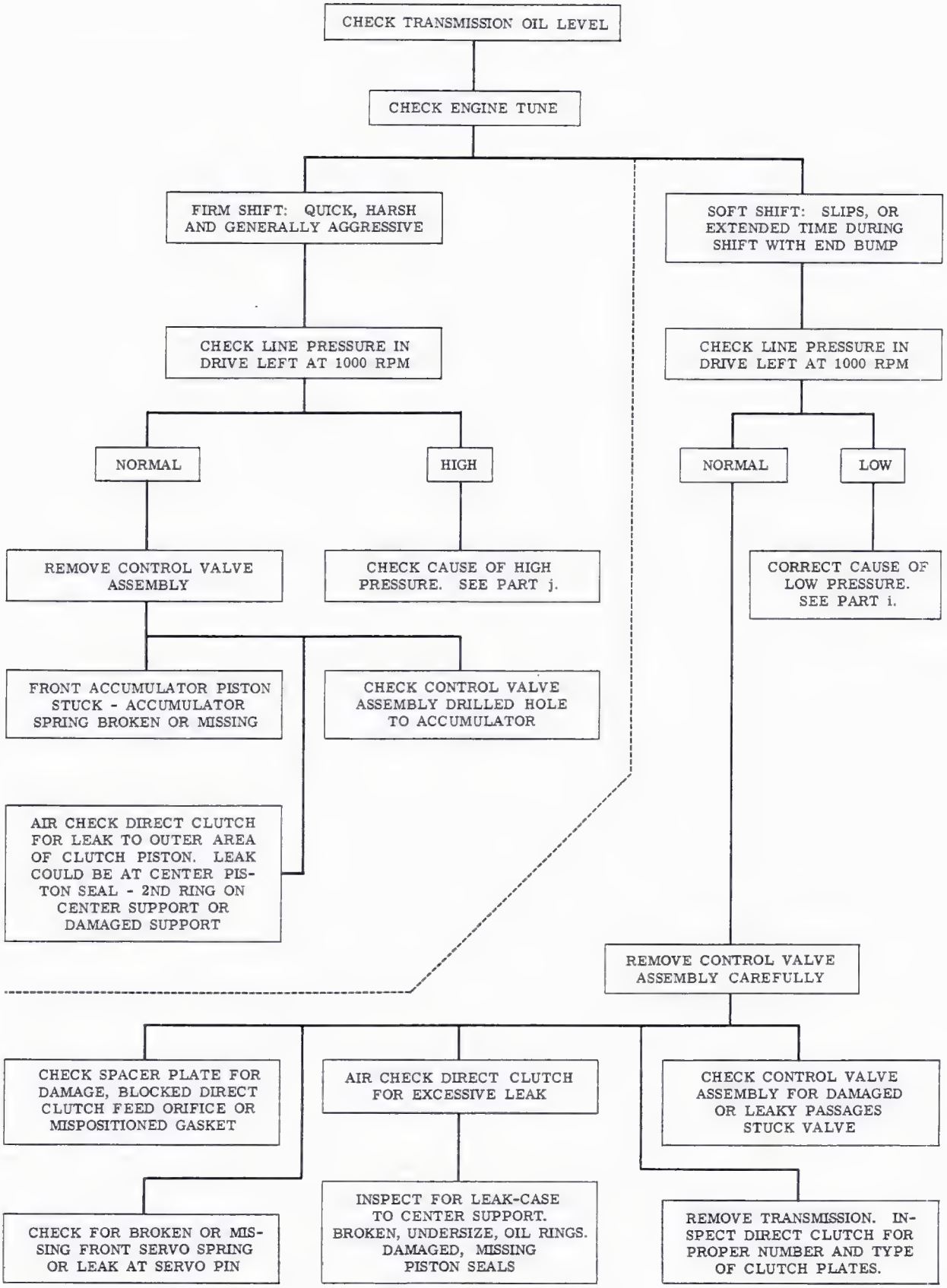


Fig. 7-21 2-3 Shift Complaint Chart

h. Transmission Troubleshooting Guide

Malfunction	Component or Instructions	Probable Cause
No Engagement of "Park"	Manual Linkage	Linkage Misadjusted
	Parking Pawl	Pawl Seized on Shaft
		Pawl Binding Due to Misalignment
	Park Actuating Rod Assembly	Rod Assembly Damaged
	Parking Bracket	Parking Bracket Loose or Mispositioned
No Release From "Park"	Return Spring	Missing, Broken, or Unhooked
Inoperative (No Engagement)	Oil Filler and Pick-up Tube	Pick-up Tube out of Position
		"O" Ring Cut or Missing at Case
		Wrong Strainer Assembly
		Strainer Contaminated - Restricted
	Pressure Regulator Valve	Valve stuck
No 1-2 Upshift and/or Delayed Upshift	See "No 1-2 Upshift and/or Delayed Upshift" in PART e.	Malfunction in Control Valve Assembly
		Malfunction in Governor or Governor Feed System
	See "No 1-2 Upshift and/or Delayed Upshift" in PART e.	Malfunction in Detent System
	See "No 1-2 Upshift and/or Delayed Upshift" in PART e.	Malfunction in Modulator Vacuum Feed System to Modulator
	Intermediate Clutch	Leaking Piston Seals
	Intermediate Sprag	Installed in Reverse Position
Slipping Reverse	Rear Servo and Accumulator Assembly	Wrong Piston Pin in Assembly
		Leaking Accumulator Oil Seal
		Leaking Servo Piston Oil Seal
	Rear Band	Worn or Damaged

h. Transmission Troubleshooting Guide (Cont'd.)

Malfunction	Component or Instructions	Probable Cause
1st Gear Noise	Reaction and Output Carrier Assemblies	Excessive Clearance Due to Wear Gear Component Damage Transmission grounded to body
Double Detent Condition. When transmission is in Drive left and a minimal pressure is applied toward Drive right, a downshift occurs.	Transmission linkage.	Transmission and column detent not aligned

i. Causes of Low Line Pressure

1. Low Transmission Oil Level
2. Modulator Assembly
   See Part n for Check
3. Strainer
   A. Blocked or Restricted
   B. "O" Ring on Intake Pipe Omitted or Damaged
   C. Split or Leaking Intake Pipe
4. Pump
   A. Gear Clearance, Damaged, Worn
   B. Pressure Regulator Spring, Too Weak
   C. Not Enough Spacers in Pressure Regulator
5. Internal Circuit Leaks
   A. Forward Clutch Leak (Pressure Normal in Neutral and Reverse - Pressure Low in Drive)
      1. Check Pump Rings
      2. Check Forward Clutch Seals
   B. Direct Clutch Leak (Pressure Normal in Neutral and All Drive Ranges - Pressure Low in Reverse)

j. Causes of High Line Pressure

1. Vacuum Leak
   A. Full Leak-Vacuum Line Disconnected
   B. Partial Leak in Line From Engine to Modulator
   C. Improper Engine Vacuum
   D. Vacuum Operated Accessory Leak
2. Damaged Modulator
   A. Stuck Valve
   B. Water in Modulator
   C. Not Operating Properly
3. Detent System
   A. Detent Switch Actuated or Shorted
   B. Detent Wiring Shorted
   C. Detent Solenoid Stuck Open
   D. Detent Feed Orifice in Spacer Plate Blocked
   E. Detent Solenoid Loose
   F. Detent Valve Bore Plug Damaged
   G. Detent Regulator Valve Pin Short
4. Pump
   A. Pressure Regulator and/or Boost Valve Stuck
   B. Incorrect Pressure Regulator Spring
   C. Too Many Pressure Regulator Valve Spacers
   D. Pump Casting Bad
5. Control Valve Assembly
   A. Control Valve Assembly to Spacer Gasket Off Location
   B. Gaskets Switched

k. Causes of Improper Vacuum at Modulator

1. Engine
   A. Tune Up
   B. Loose Vacuum Fittings
   C. Vacuum Operated Accessory Leak
2. Vacuum Line to Modulator
   A. Leak
   B. Loose Fitting
   C. Restricted Orifice
   D. Carbon Build-Up at Modulator Vacuum Fitting
   E. Pinched Line
   F. Grease in Pipe (No or Delayed Upshift - Cold)

l. Causes of Oil Leaks

1. Transmission Oil Pan Leaks
   A. Attaching Bolts Not Correctly Torqued
   B. Improperly Installed or Damaged Pan Gasket
   C. Oil Pan Gasket Mounting Face Not Flat
2. Case Extension Leak
   A. Attaching Bolts Not Correctly Torqued
   B. Rear Seal Assembly - Damaged or Improperly Installed
   C. Gasket or Seal - (Extension to Case) Damaged or Improperly Installed
   D. Porous Casting
3. Case Leak
   A. Filler Pipe "O" Ring Seal Damaged or Missing; Misposition of Filler Pipe Bracket to Engine - "Loading" One Side of the "O" Ring
   B. Modulator Assembly "O" Ring Seal - Damaged or Improperly Installed
   C. Connector "O" Ring Seal - Damaged or Improperly Installed
   D. Governor Cover, Gasket and Bolts - Damaged, Loose, Case Face Leak
   E. Speedometer Gear - "O" Ring Damaged
   F. Manual Shaft Seal - Damaged, Improperly Installed

h. Transmission Troubleshooting Guide (Cont'd.)

Malfunction	Component or Instructions	Probable Cause
No 2nd Gear (Shifts 1-3)	2-3 Shift Valve	Stuck Open
	Intermediate Clutch	Broken Oil Seal Ring in Center Support
		Cut Seals on Intermediate Clutch Piston
		Burnt Intermediate Clutch Plates
No 3-2 Downshift	Downshift Switch	Electrical Failures (open)
		Return spring defect
	Harness Connector	Poor Connections
	Electrical Connector	Detent Solenoid Not Connected to Connector
	Detent Solenoid	Open Windings
	Valve Body	Detent Valve Sticking
No Braking Effect in 1st Gear ("Low" Position)	Rear Servo and Accumulator Assembly	Wrong Piston Pin
		Stuck Piston
		Piston or Seal Leaking
	Rear Band	Broken Rear Band
		Burnt Lining
No Braking Effect in 2nd Gear (Drive Right)	Front Servo	Leaking Piston or Seal Ring
		Short Servo Pin
	Front Band	Broken Front Band
		Burnt Front Band
Sluggish	Engine out of tune	Tune engine
	Pump (Low Pressure)	Low Fluid Level
		Excessive Internal Leakage
Low Shift Points	Vacuum Modulator Assembly	Damaged Bellows
	Governor	Damaged or Defective Weights
	Control Valve Body	Wrong Spring in 1-2 Valve Train
		Wrong Valve Body Assembly

h. Transmission Troubleshooting Guide (Cont'd.)

Malfunction	Component or Instructions	Probable Cause
Slipping 1st Gear	Modulator Valve	Valve Sticking
	Converter	Leakdown Resulting From Missing or Broken Turbine Shaft Oil Seal Ring
	Pressure Regulator Valve	Valve Sticking
	Forward Clutch	Leaking Piston Seal
		Stuck Check Ball in Forward Clutch Housing
		Outer Area Feed Hole Not Drilled or Restricted
		Worn Clutch Plates
	Roller Clutch	Damaged or Worn Cam or Race
		Damaged Rollers
		Damaged Energizing Springs
1-2 Shift Feel Complaint	See "1-2 Shift Feel Complaint" in PART f.	
2-3 Shift Complaint	See "2-3 Shift Complaint" in PART g.	
Slipping All Ranges	Fluid Level	Low Fluid Level Resulting in Low Pressure
	Pressure Regulator	Sticking or Damaged Orifice Cup Plug
Drive in Neutral	Manual Linkage	Misadjusted Manual Linkage
	Manual Valve	Linkage End Broken on Valve With Valve Body in Drive Position
	Forward Clutch	Clutch Plates Burned and Warped
Start in 2nd or 3rd Gear	Governor Assembly	Governor Sticking
No Reverse Engagement	Direct Clutch	Broken Oil Seal Rings in Center Support
		Center Support Ring Lands Machined Oversized (wide)
		Mis-assembled Clutch Plates - Composition Discs Assembled Next to Each Other
		Outer Oil Seal Damaged
	Center Support	Loose in Case
		Damaged or Not Sealing to Case Properly

G. Line Pressure Tap Plug - Stripped, Shy Sealer Compound
H. Vent Pipe (Refer to Item 5)
I. Porous Case
4. Front End Leak
A. Front Seal - Damaged (Check Converter Neck For Nicks, Etc., Also for Pump Bushing Moved Forward) Garter Spring Missing
B. Pump Attaching Bolts, and Seals - Damaged, Missing, Bolts Loose
C. Converter - Leak in Weld
D. Pump "O" Ring Seal - Damaged. (Also Check Pump Oil Ring Groove and Case Bore)
E. Porous Casting (Pump or Case)
5. Oil Comes Out Vent Pipe
A. Transmission Over-Filled
B. Water in Oil
C. Strainer "O" Ring Damaged or Improperly Assembled Causing Oil to Foam
D. Foreign Material Between Pump and Case or Between Pump Cover and Body
E. Case - Porous, Pump Face Improperly Machined
F. Pump - Shy of Stock - Porous
G. Pump to Case Gasket Mispositioned
H. Pump Breather Hole Blocked or Missing

m. Control Valve Assembly— Governor Line Pressure Check

1. Install Line Pressure Gage
2. Disconnect Vacuum Line at Vacuum Modulator
3. With Car on Hoist (Driving Wheels, Off Ground), Foot Off Brake, In Drive, Check Line Pressure at 1000 RPM
4. Slowly Increase Engine RPM to 3000 RPM and Determine If Pressure Drop Occurs (7 PSI or more)
5. If Pressure Drop Occurs, Disassemble, Clean and Inspect Control Valve Assembly
6. If No Pressure Drop Occurs:
A. Inspect Governor
1. Stuck Valve
2. Weight Freeness
3. Restricted Orifice in Governor Valve
B. Governor Feed System
1. Check Screen in Control Valve Assembly
2. Check For Restrictions in Governor Pipe

n. Vacuum Modulator Assembly

The following procedure is recommended for checking Turbo Hydra-Matic modulator assemblies in the field before replacement is accomplished.

1. Vacuum Diaphragm Leak Check. Insert a pipe cleaner into the vacuum connector pipe as far as possible and check for the presence of transmission oil. If oil is found, replace the modulator.

NOTE: Gasoline or water vapor may settle in the vacuum side of the modulator. If this is found without the presence of oil the modulator should not be changed.

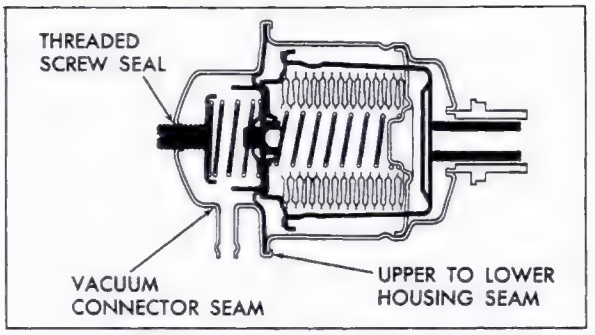


Fig. 7-22 Vacuum Modulator - Sectional

2. Atmospheric Leak Check. Apply a liberal coating of soap bubble solution to the vacuum connector pipe seam, the crimped upper to lower housing seam, and the threaded screw seal, Fig. 7-22. Using a short piece of rubber tubing, apply air pressure to the vacuum pipe by blowing into the tube and observe for leak bubbles. If bubbles appear, replace the modulator.

NOTE: Do not use any method other than human lung power for applying air pressure, as pressures over 6 psi may damage the modulator.

3. Bellows Comparison Check. Make a comparison gage, as shown in Fig. 7-23, and compare the load of a known good Hydra-matic modulator with the assembly in question.

a. Install the modulator that is known to be acceptable on either end of the gage.

b. Install the modulator in question on the opposite end of the gage.

c. Holding the modulators in a horizontal position, bring them together under pressure until either modulator sleeve end just touches the line in the center of the gage. The gap between the opposite modulator sleeve end and the gage line should then be 1/16" or less. If the distance is greater than this amount, the modulator in question should be replaced.

4. Sleeve Alignment Check. Roll the main body of the modulator on a flat surface and observe the sleeve for concentricity to the can. If the sleeve is concentric and the plunger is free, the modulator is acceptable.

Once the modulator assembly passes all of the above tests, it is an acceptable part and should be re-used.

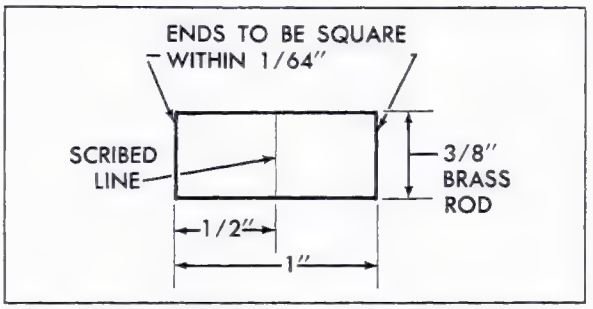


Fig. 7-23 Vacuum Modulator Test Gage

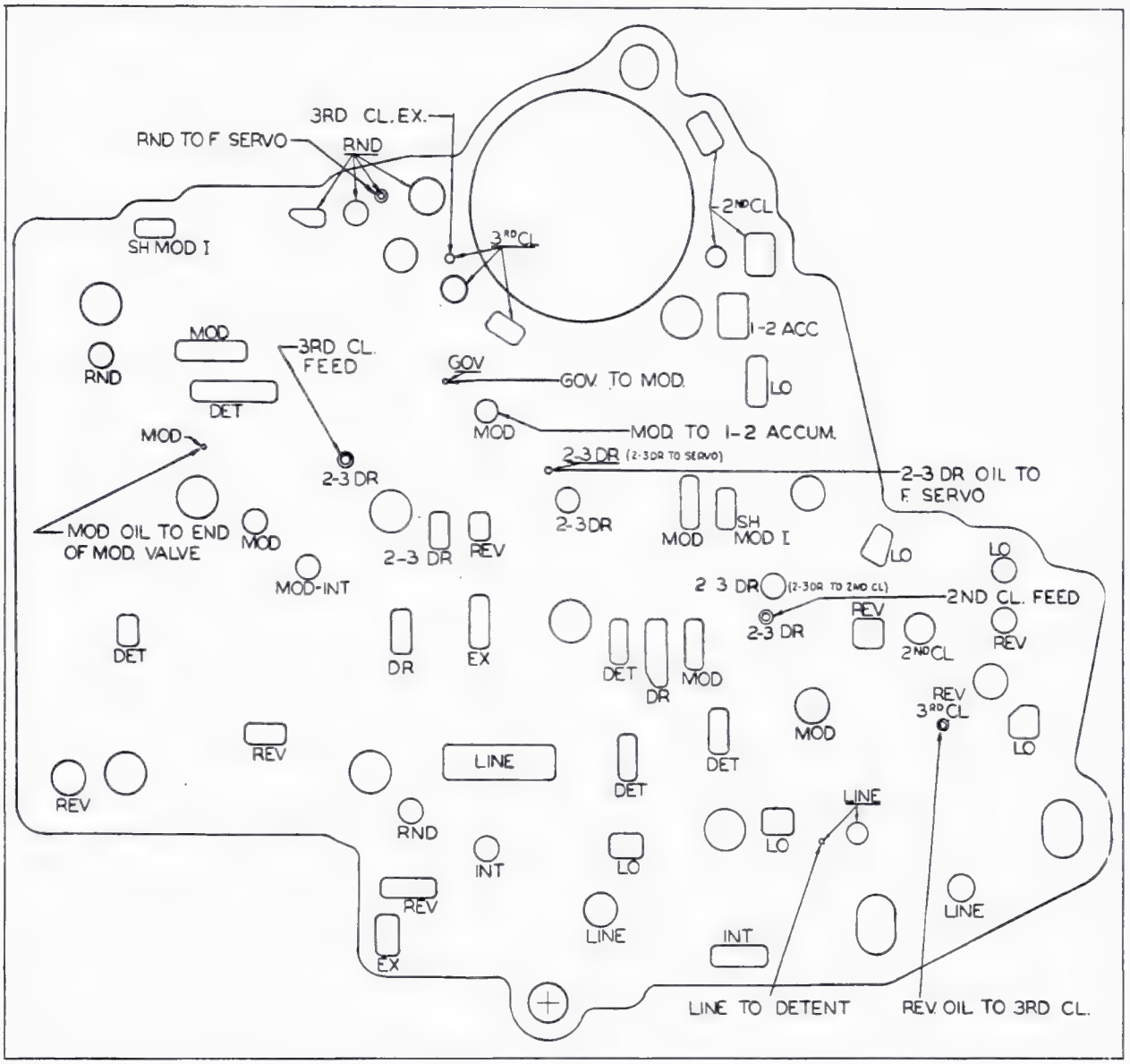


Fig. 7-24 AA and AB Spacer for Control Valve Assembly

o. Model AA and AB Clutch Parts

Clutch	No. of Flat Steel Clutch Plates	No. of Waved Steel Clutch Plates
Forward Clutch	*4	1
Direct Clutch	*5	1
Intermediate Clutch	2	1

*Steel Plate Thickness - .0915"

Clutch	No. of Clutch Composition Plates	No. of Piston Release Springs
Forward Clutch	5	16
Direct Clutch	6	16
Intermediate Clutch	3	12

2. Fluid Leakage Precautions

The precautions that must be observed to prevent fluid leaks are as follows:

1. Use new gaskets and O-ring seals whenever there is a disassembly.

2. Use a very small amount of petrolatum to hold gaskets and thrust washers in place during assembly, or to seal gaskets. Never use gasket paste or shellac.

3. Make sure that composition cork and paper gaskets are not wrinkled or creased when installed. Make sure that gaskets have not stretched or shrunk during storage.

4. Make sure the square type O-ring seals are installed squarely and are not twisted during assembly.

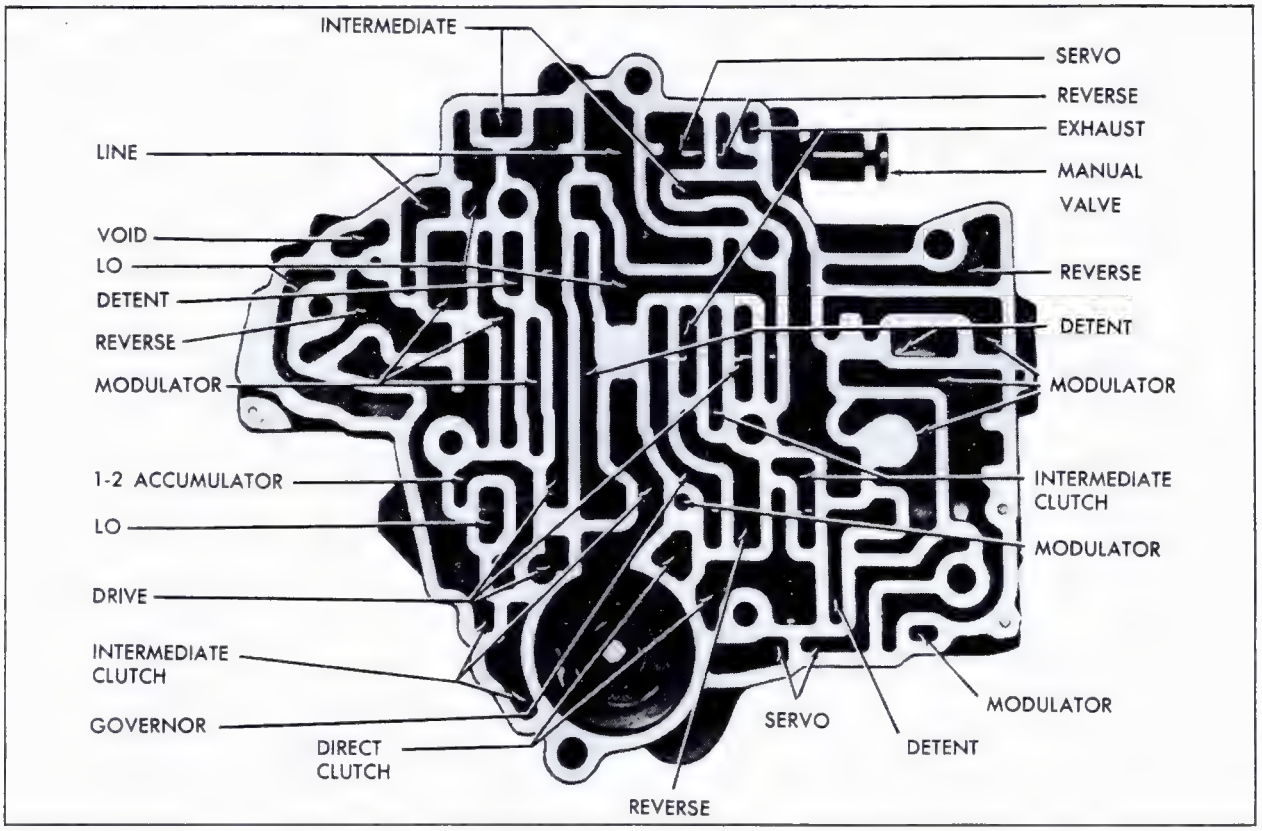


Fig. 7-25 Control Valve Body Oil Passages

5. Make sure that mating surfaces of castings are flat and smooth, free of deep scratches, chips, and burrs.

6. Torque bolts to proper torque.

3. Points of Possible Oil Leaks

When checking for oil leaks, first determine whether leak originates from transmission or engine. The original factory fill fluid in the transmission is formulated with a red aniline dye to assist in locating leaks. If the color of the dye cannot be detected in the transmission fluid, the fluid should be changed. Red dye appearing in the leaking oil will give positive identification as to the location of the leak.

If oil leak is found to be in transmission, check for leak in following areas:

a. Front End

It will be necessary to remove lower cover at front of transmission case to determine location of leaks at front end. To correct leaks at front end, it will be necessary to remove transmission from car.

1. Pump oil seal leak - Check pump oil seal to make certain it is correctly installed and not damaged.

When installing a new pump oil seal, Note 14, make certain that bore is free from foreign material and that garter spring on seal is correctly positioned. Check finish of converter neck and bearing surface in pump body.

2. Pump assembly-to-case square cut O-ring or gasket damaged.

3. Rubber coated-washers on pump attaching screws damaged or missing.

4. Converter - Inspect converter for indications of leakage. See Note 15, for checking procedure.

b. Extension Housing

1. Extension housing oil seal not installed properly or damaged.

2. Gasket (extension housing-to-case) improperly installed or damaged.

3. Extension housing-to-case attaching screws not torqued to specifications. Tighten to 23 foot-pounds.

4. Porous or cracked casting.

5. Plug in propeller shaft front slip yoke loose or leaks on 697 or 698 series cars.

6. O-ring on output shaft, on AA transmission, improperly installed or damaged.

c. Transmission Case

1. Speedometer driven gear housing retainer attaching screw loose. Tighten to 18 foot-pounds.

2. Speedometer driven gear housing O-ring or lip seal damaged.

3. Governor cover attaching screws not tight. Tighten screws to 18 foot-pounds.

4. Damaged governor gasket.

5. Solenoid connector terminal O-ring damaged.

6. Parking pawl shaft cup plug not properly installed.

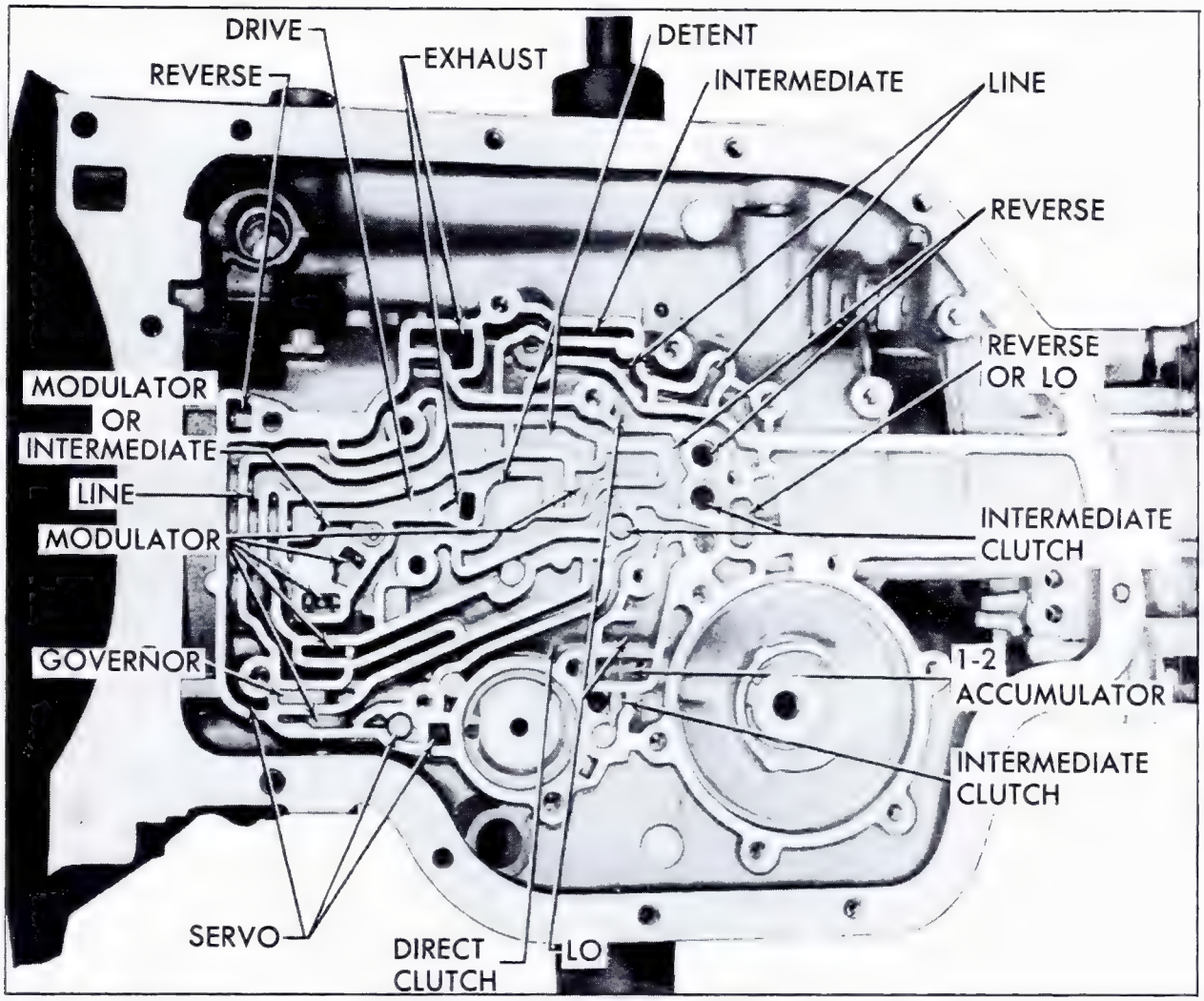


Fig. 7-26 AA and AB Transmission Case Oil Passages - Bottom View

7. Manual shaft seal damaged.
8. Vacuum modulator damaged.
9. Vacuum modulator retainer screw loose. Tighten to 18 foot-pounds.
10. Vacuum modulator diaphragm damaged. Check as described in Note 1f.

NOTE: A ruptured diaphragm would allow transmission oil to be drawn into intake manifold and vacuum line. Uusually the exhaust

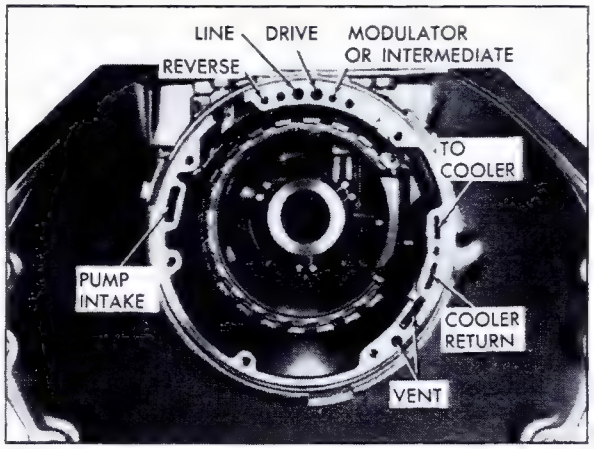


Fig. 7-27 AA and AB Transmission Case

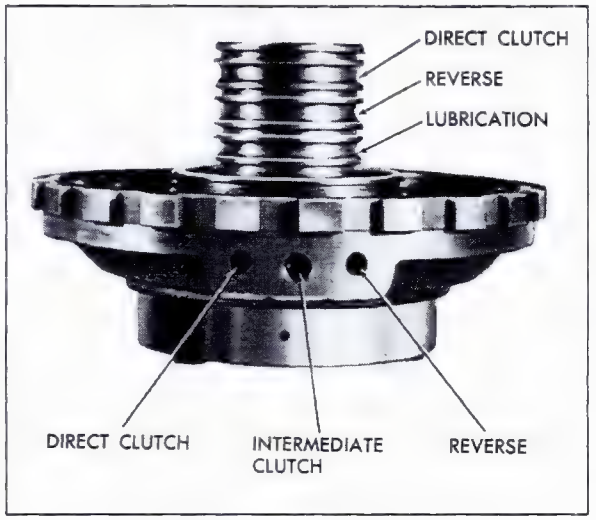


Fig. 7-28 Center Support Oil Passages

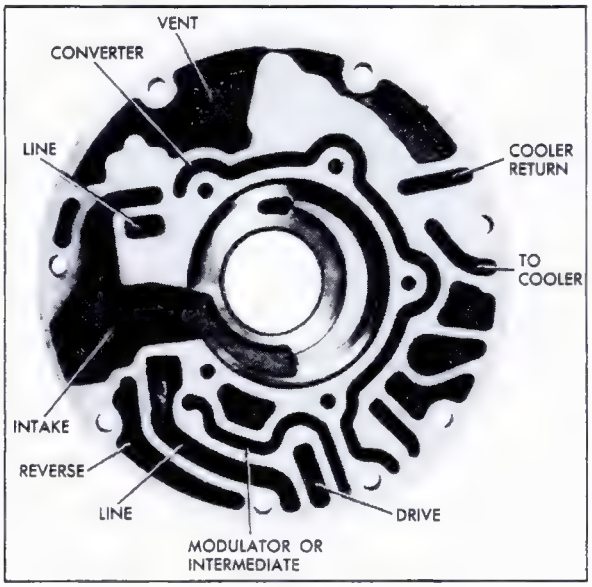


Fig. 7-29 Pump Body Oil Passages

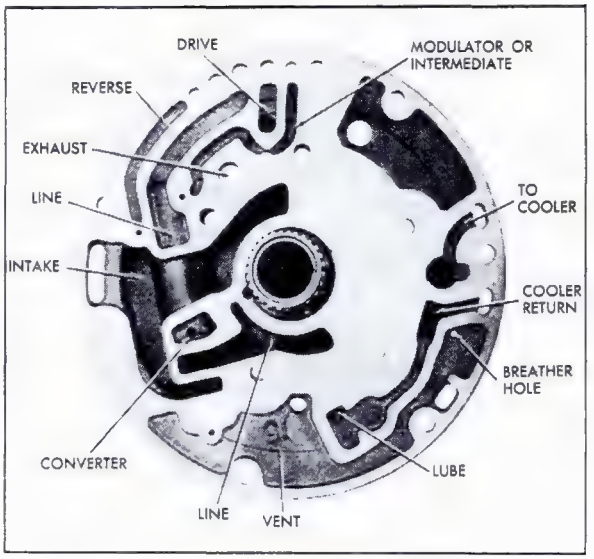


Fig. 7-30 Pump Cover Oil Passages

will be excessively smoky due to transmission oil added to the combustion. Oil level of transmission will also be low.

11. Bottom pan gasket damaged.

12. Bottom pan attaching screws loose. Tighten to 12 foot-pounds.

13. Line pressure plug not tight. Tighten to 10 foot-pounds.

14. Porous or cracked casting.

15. Vent pipe.

a. Transmission over-filled.

b. Water in oil.

c. Pump to case gasket mispositioned.

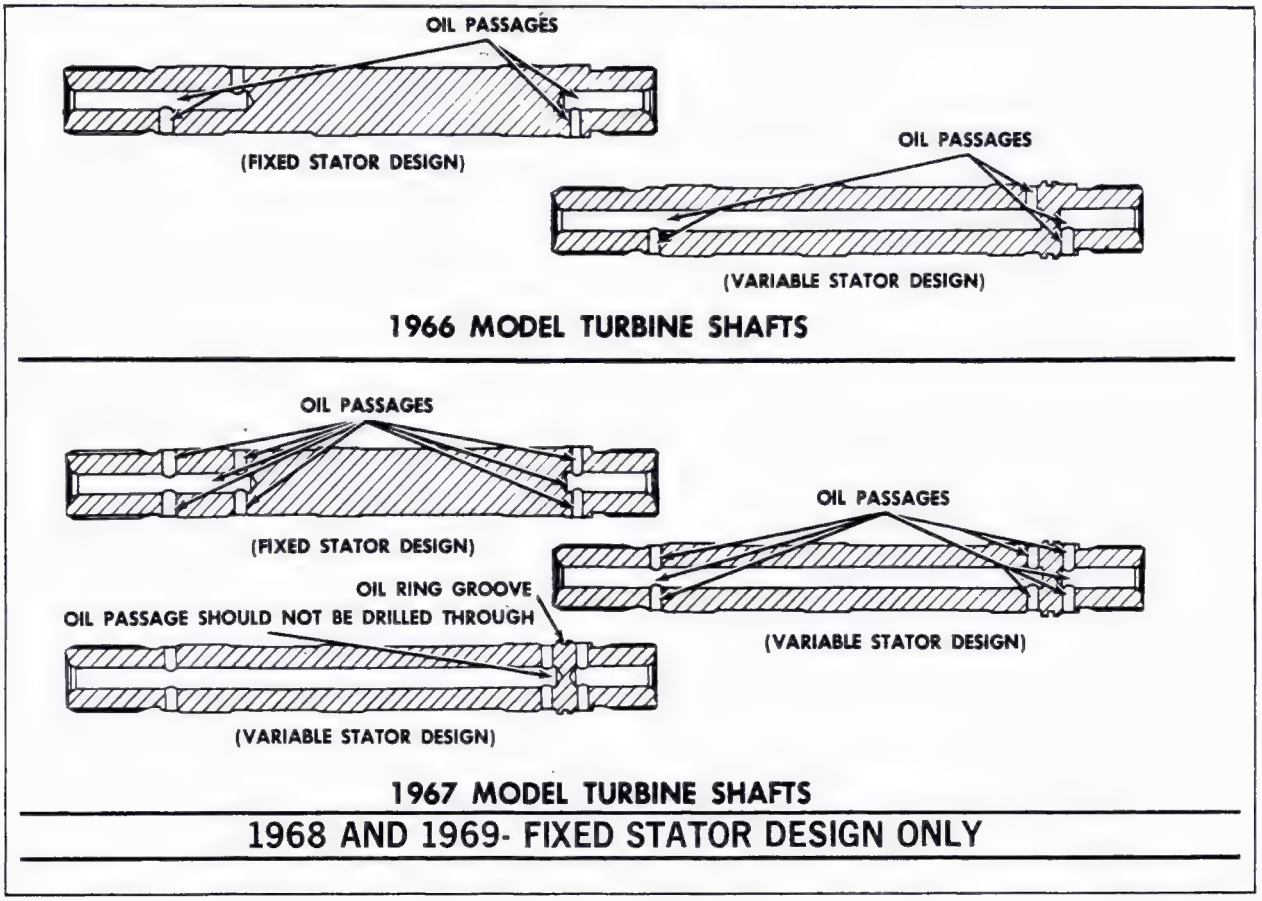


Fig. 7-31 Turbine Shaft

d. Foreign material between pump and case, or between pump cover and body.

e. Case - Porous, pump face improperly machined.

f. Pump - Shy of stock, porous. Breather hole in pump cover plugged.

g. Cut O-ring or intake or grommet on strainer assembly.

d. Oil Cooler Pipe Connections

1. Outside oil cooler pipe connections improperly installed or damaged. Also connectors in radiator and transmission.

2. Oil cooler pipe connections not tight. Tighten to 28 foot-pounds at transmission and 40 foot-pounds at radiator.

3. Flare on oil cooler pipes damaged at radiator or transmission.

e. Filler Pipe

1. O-ring damaged or improperly installed on pipe.

2. Filler pipe not fully seated in case.

f. Internal Leaks

It will be necessary to remove bottom pan to determine location of internal leaks.

1. Governor pipes damaged.

2. Rear servo cover attaching screws not tight. Tighten to 18 foot-pounds.

3. Rear servo cover gasket damaged.

4. Control valve assembly-to-spacer or case gaskets damaged.

5. Control valve assembly attaching screws loose. Tighten to 8 foot-pounds.

6. Solenoid gaskets damaged.

7. Solenoid attaching screws loose. Tighten to 8 foot-pounds.

8. Intake pipe O-ring or strainer grommet damaged.

9. Rear servo square cut O-ring improperly installed or damaged.

10. Case valve body mounting face not flat.

4. Manual Linkage Adjustments (Fig. 7-32)

1. Loosen nut on steering column manual lever to relay rod clamp.

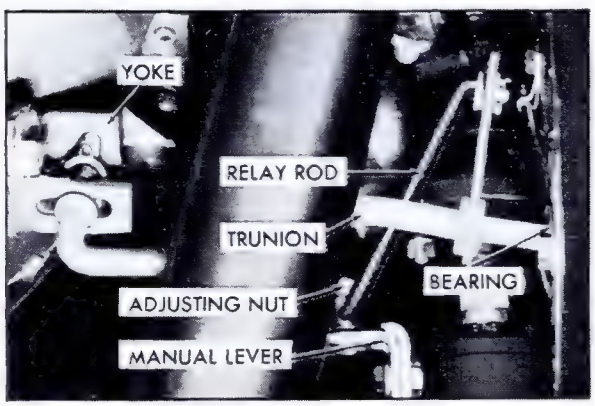


Fig. 7-32 Adjusting Manual Linkage

2. Pull relay rod up to position transmission shift valve in Park, then push rod down to the third (Neutral) step. Make sure rod is centered in this detent position.

3. Position selector lever in Neutral detent in steering column.

4. Tighten steering column manual lever to relay rod clamp nut.

5. Check operation of selector lever by performing the following steps:

a. Lift lever and move to Neutral detent. (This is the detent in the transmission.) Release the lever and check to make sure that the lever fits into neutral detent in steering column.

b. Move lever to Drive detent. There should be a slight travel of the lever beyond this detent until the drive stop in the steering column is reached.

c. Move lever to Reverse detent and check as in b above.

NOTE: Whenever linkage is readjusted, check for proper operation of neutral switch, parking brake release, back-up lights and column lock in Park. Refer to Section 12, Note 41, for proper method of checking function of neutral switch.

5. Transmission Downshift Switch Adjustment

1. Remove carburetor air cleaner.

2. Make certain that carburetor is adjusted to specification and that throttle linkage is at low speed idle setting.

3. If transmission downshift switch is properly adjusted, a #31 (wire gage size) drill or equivalent can be inserted through the calibrating hole below lower wire terminal extending through to carburetor side of switch.

4. If adjustment is necessary, loosen the two 7/16" switch mounting screws and position switch for proper alignment to perform step 3.

5. With switch positioned, tighten mounting screws and remove #31 drill from calibrating hole through switch.

6. Install air cleaner.

6. Downshift Solenoid Circuit Check

NOTE: Before checking the downshift solenoid circuitry, make certain that the transmission downshift switch is properly adjusted as described in Note 5.

1. With transmission shift lever in Park, turn ignition switch to "ON" position, but do not start car. Leave ignition switch "ON" throughout checking procedure.

2. Working under hood, slowly advance throttle linkage to wide open position. One click should be heard from transmission.

3. Allow throttle to return to closed position. One click should be heard from transmission.

4. If system performed as described above, downshift circuit is operating properly. If system does not perform as described above, proceed to step 5.

5. Use test light to check orange wire at connector on side of transmission case. Test light should light with throttle wide open and go out when throttle is released.

a. If system operates as described above, but did not perform properly during steps 1-3, replace solenoid after first checking to see that internal wiring is operational.

b. If light fails to light with throttle in wide open position, the circuit is open, proceed to step 6.

c. If light lights with throttle closed, the circuit is shorted. Proceed to step 9.

6. Remove air cleaner. Remove orange wire connector at transmission downshift switch. Use test light to check from the bare terminal at switch with throttle wide open.

a. If test light lights, replace orange wire. Recheck system.

b. If test light fails to light, proceed to step 7.

7. Check black striped orange feed wire at transmission downshift switch with test light.

a. If test light lights, replace transmission downshift switch. Recheck system.

b. If test light fails to light, proceed to step 8.

8. Check 10 amp gages and transmission control fuse in fuse panel.

a. If necessary to replace fuse, recheck system.

b. If fuse is all right, it will be necessary to locate the open in the wiring. Test the circuit continuity from the black-striped orange wire at the downshift switch to the battery.

9. Remove air cleaner. Remove orange wire connector at transmission downshift switch. Use test light to check from the bare terminal at switch with throttle closed.

a. If test light fails to light, orange wire is shorted. Correct shorting condition.

b. If test light lights, proceed to step 10.

10. With throttle in closed position, check black striped orange feed wire at transmission downshift switch.

a. If test light fails to light, replace transmission downshift switch. Recheck system.

b. If test light lights, it will be necessary to locate the short in the wiring. Test the circuit from the black-striped orange wire at the downshift switch to the battery.

7. Checking and Adding Fluid

CAUTION: Car level and oil temperature are particularly important when checking fluid level on a Turbo Hydra-matic transmission. Careful attention to the following procedures is necessary in order to determine the actual fluid level.

a. Turbo Hydra-Matic Oil Recommendations

Whenever fluid is added on 1969 cars, use only DEXRON transmission fluid. General Motors DEXRON automatic transmission fluid has been especially formulated and tested for use in the 1969 Cadillac Turbo Hydra-matic transmission. Other automatic transmission fluids identified with the mark DEXRON are also recommended.

NOTE: Use either DEXRON automatic transmission fluid, or Type A automatic transmission fluid identified by the mark "AQ-ATF" followed by a number and the suffix letter "A" (AQ-ATF-XXXXA) in all 1967 and earlier model automatic transmissions.

The transmission dipstick and filler tube on 1969 Cadillacs is located under the hood at the right rear top of the engine.

The bottom pan should be drained every 24,000 miles or 2 years, whichever occurs first, and fresh fluid added to obtain the proper level on the dipstick, Fig. 7-33. For cars subjected to heavy city traffic during hot weather, or in commercial use, when the engine is regularly idled for prolonged periods, the bottom pan should be drained every 12,000 miles.

The oil intake system incorporates an intake pipe O-ring seal and strainer assembly that should be replaced after the first 24,000 miles or 2 years, whichever occurs first.

In any case of a major transmission failure, the strainer assembly must be replaced. In addition, the oil cooler and cooler lines should be flushed.

b. Checking and Adding Fluid

Fluid level should be checked at every engine oil change. The full "F" and "ADD" dimple marks on the transmission dipstick indicate one pint difference. Correct fluid level is determined at normal operating temperature (170°F.). Careful attention to transmission oil temperature is necessary, as proper fluid level at low operating temperatures will be below the "ADD" mark on the dipstick, Fig. 7-33, and proper fluid level at higher operating temperatures will rise above the full "F" mark. Fluid level must always be checked with car on level surface, and with engine running to make certain converter is full. To determine proper fluid level, proceed as follows:

CAUTION: The full mark on the dipstick is an indication of transmission fluid at normal operating temperature of 170°F. This temperature is only obtained after at least 15 miles of expressway driving or equivalent of city driving.

1. With manual control lever in Park position start engine. DO NOT RACE ENGINE. Move manual control lever through each range.

2. Immediately check fluid level with selector lever in Park, engine running, and vehicle on LEVEL surface.

At this point, when a reading is made, fluid level on the dipstick should be at the "FULL" mark.

3. If additional fluid is required, add fluid to the "FULL" mark on the dipstick.

If vehicle is not driven 15 expressway miles or equivalent, and it becomes necessary to check fluid level, the transmission fluid must be at room temperature (70°F.).

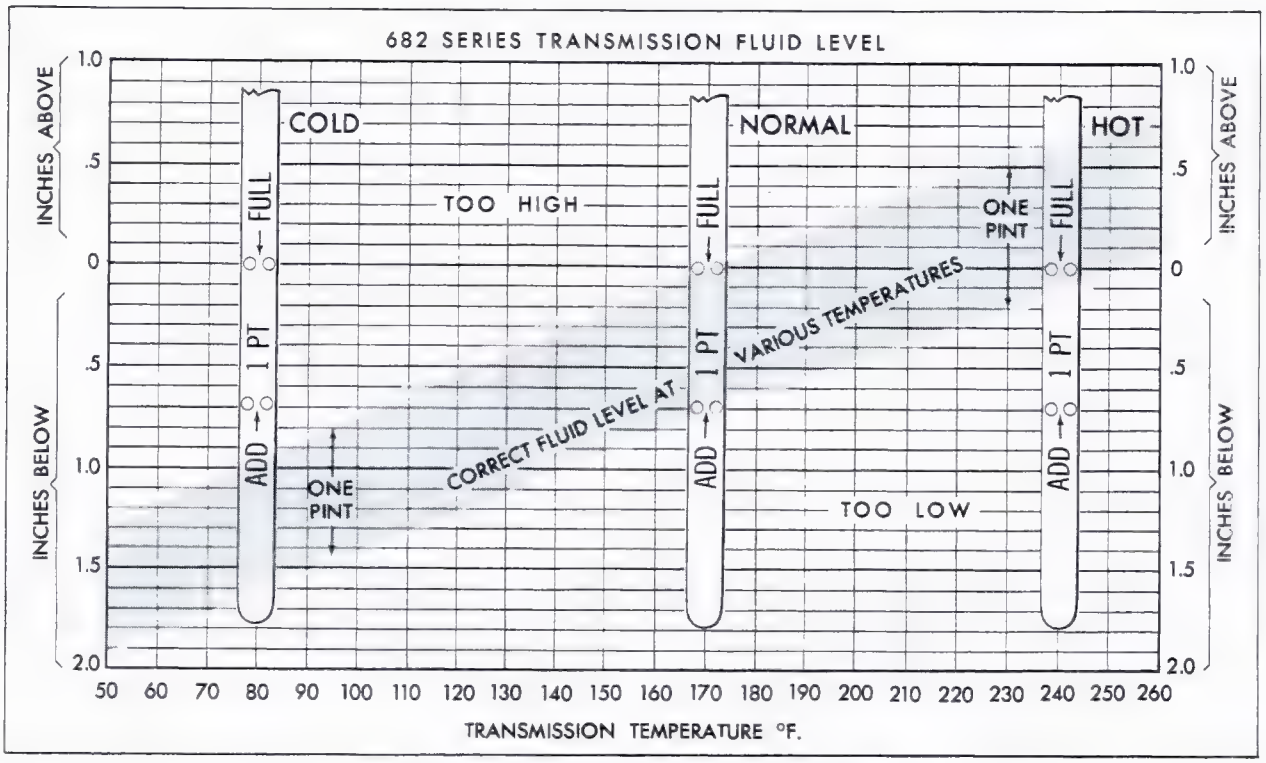


Fig. 7-33 Transmission Oil Level (Except 693)

With fluid at room temperature (70°F.) follow steps 1, 2 and 3 below.

1. With manual control lever in Park position start engine. DO NOT RACE ENGINE. Move manual control lever through each range.

2. Immediately check fluid level with selector lever in Park, engine running, and vehicle on LEVEL surface.

At this point, when a reading is made, fluid level on the dipstick should be 1/4" below the "ADD" mark.

3. If additional fluid is required add fluid to bring level to 1/4" below the "ADD" mark on the dipstick.

CAUTION: Do Not Overfill, as foaming and loss of fluid through the vent pipe might occur as fluid heats up. If fluid is too low, especially when Cold, complete loss of drive may result which can cause transmission failure.

NOTE: If transmission fluid level is correctly established at 70°F. it will appear at the "FULL" mark on the dipstick when the transmission reaches normal operating temperature (170°F.). The fluid level is set 1/4" below the "ADD" mark on the dipstick to allow for expansion of the fluid which occurs as transmission temperatures rise to normal operating temperature of 170°F.

c. Draining Bottom Pan and Replacing Intake Pipe and Strainer Assembly

To drain bottom pan only, eliminate steps 5, 6 and 7.

1. Remove dipstick from filler tube and insert a length of hose secured to a suction gun down the filler tube. Remove enough transmission fluid so that bottom pan will not overflow when removed.

2. Raise car on hoist or place on jack stands and provide container to collect draining oil.

3. Remove bottom pan and gasket. Discard gasket.

4. Drain fluid from bottom pan. Clean pan with solvent and dry thoroughly with clean compressed air.

5. Remove strainer retainer bolt.

6. Remove intake pipe and strainer assembly. Remove and discard intake pipe O-ring and strainer.

7. Install new intake pipe O-ring onto pipe and install intake pipe into strainer assembly.

8. Install strainer intake pipe assembly into case bore.

9. Install strainer retainer bolt.

10. Install new gasket on bottom pan and install bottom pan. Tighten bottom pan attaching screws to 12 foot-pounds.

11. Lower car and add 4 quarts of transmission fluid through filler tube when replacing intake pipe O-ring seal and strainer assembly. When draining bottom pan only add 2 quarts of transmission fluid.

12. Operate engine at 800 rpm for approximately 1-1/2 minutes with selector lever in park "P" position.

13. Reduce engine speed to slow idle and check fluid level. Add fluid, if necessary, to bring to proper level, Fig. 7-33.

d. Adding Fluid to Fill Dry Transmission and Converter Assembly

The fluid capacity of the Turbo Hydra-matic transmission and converter assembly is approximately 25 pints but correct level is determined by mark on dipstick rather than by amount added. It is important that proper level be maintained. In cases of transmission overhaul, when a complete fill is required, including converter, proceed as follows:

1. Add 8 quarts of transmission fluid through filler tube.
2. Operate engine at 800 rpm for approximately 1-1/2 minutes with selector lever in park "P" position.
3. Reduce engine speed to slow idle.
4. Check fluid level and add additional fluid, if necessary, to bring to proper level, Fig. 7-33.

8. Towing Instructions

1969 Cadillac cars cannot be started by pushing, and this procedure should never be attempted. If the car cannot be started in the normal manner or by the use of jumper cables, it should be towed to the nearest authorized service facility.

If the transmission, drive line, or axle do not have a malfunction, the vehicle may be towed in Neutral "N" at speeds up to 35 mph for distances up to 50 miles. For higher speeds or extended distances, it is recommended that propeller shaft be disconnected or rear wheels be off ground. Before towing, check transmission fluid level. Fluid level must be above full mark on the dipstick with engine "OFF". Always tow car with transmission shift lever in Neutral position.

If tow requires raising front or rear of car, wheels should be lifted just slightly off the ground. When towing with rear wheels raised, tie down steering wheel with front wheels in straight ahead position. If keys are not available see special towing instructions sent to each dealer.

9. Units That Can Be Removed With Transmission in Car

The following units can be removed from the transmission without removing transmission from car.

While the detailed procedure for removing each of the units, other than the extension housing and oil seal, and pressure regulator valve, is not outlined separately, the procedures covered under the transmission disassembly and assembly notes will apply.

a. Extension Housing

Removal - Note 11a

Installation - Note 11b

Oil Seal Replacement - Note 10

b. Pressure Regulator Valve

Removal - Note 12a

Installation - Note 12b

c. Vacuum Modulator and Valve

Removal - Note 16a

Installation - Note 18j

d. Governor Assembly

Removal - Note 16b

Disassembly - Note 17f

Installation - Note 18k

e. Speedometer Driven Gear Assembly

Removal - Note 16c

Disassembly - Note 17g

Installation - Note 18l

f. Intake Pipe and Strainer Assembly and Bottom Pan

Removal - Note 16d
Installation - Note 18m } or Note 7c

g. Control Valve Assembly, Governor Pipes, and Detent Spring and Roller Assembly

Removal - Note 16e

Disassembly - Note 17h

Installation - Note 18i

h. Rear Servo Assembly

Removal - Note 16f

Disassembly - Note 17i

Installation - Note 18h

i. Detent Solenoid, Solenoid Connector, Control Valve Spacer and Gaskets, Check Balls, and Front Servo Assembly

Removal - Note 16h

Front Servo Disassembly - Note 17j

Installation - Note 18g

j. Detent Lever, Manual Shaft, and Parking Linkage

Removal - Note 16l

Installation - Note 18d

10. Extension Housing Oil Seal Replacement (Transmission in Car)

1. Raise car on hoist or place on jack stands.
2. Remove propeller shaft assembly as described in Section 4, Note 27a or 28a.

NOTE: On 697 and 698 series cars, check propeller shaft front slip yoke for leak as described in Section 4, Note 29.

3. Use hammer to drive screwdriver under lip

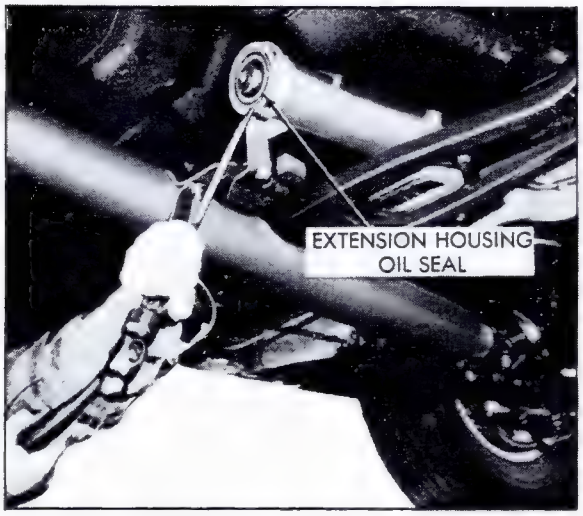


Fig. 7-34 Removing Extension Housing Oil Seal

of oil seal and pry seal out of housing, Fig. 7-34.

4. Install new extension housing oil seal.

CAUTION: To prevent damage to the seal and correctly install, follow the procedure below.

a. Undercut the webbing of Oil Seal Installer, J-21359, by approximately 1/8 inch, Fig. 7-35.

NOTE: Undercutting the webbing will not affect the tool's utility as a past model tool on either the extension housing or pump oil seal, but will give the needed clearance between the webbing and the extension housing oil seal.

b. Apply non-hardening sealer to outside of new seal and install seal in extension housing using Oil Seal Installer, J-21359, Fig. 7-36.

5. Install propeller shaft assembly as described in Section 4, Note 27b or 28b.

6. Lower car.

Fig. 7-35 Altering Oil Seal Installer, J-21359

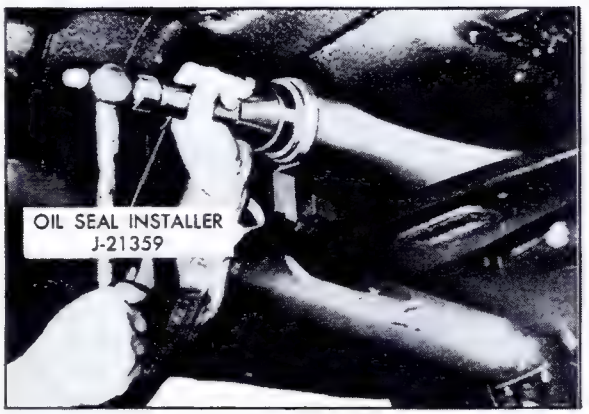


Fig. 7-36 Installing Extension Housing Oil Seal

11. Extension Housing Removal and Installation (Transmission in Car)

a. Removal

1. Raise car on hoist or place on jack stands.
2. Remove resonator support bracket from extension housing.
3. Remove propeller shaft assembly as described in Section 4, Note 27a or 28a.
4. Remove rear engine mount to extension housing attaching screws.
5. Place jack under bottom oil pan. Use a block of wood to prevent damage to pan and raise transmission to lift extension housing off rear engine mount.
6. Remove six extension housing attaching screws and slide extension housing rearward and downward to remove from car. Make certain that output shaft splines do not come in contact with extension housing oil seal, as splines could damage seal lip.
7. Remove and discard O-ring from output shaft on AA models.

b. Installation

1. Install gasket on extension housing.
2. Install new O-ring on output shaft (AA) and grease O-ring and splines if necessary.
3. Carefully install extension housing over output shaft and against transmission case. Do not permit output shaft to contact oil seal as splines could damage seal lip.
4. Install six extension housing to case attaching screws, tightening screws to 23 foot-pounds.
5. Lower transmission onto rear engine mount.
6. Install two rear engine mount to extension housing screws. Tighten screws to 55 foot-pounds.
7. Remove jack from bottom of oil pan.
8. Install propeller shaft assembly as described in Section 4, Note 27b or 28b.
9. Install resonator support bracket on extension housing. Tighten screw to 35 foot-pounds.
10. Lower car.

12. Pressure Regulator Valve Removal and Installation (Transmission in Car)

a. Removal

1. Raise car on hoist or place on jack stands. Provide container to catch oil.
2. Remove bottom pan and gasket. Drain oil.
3. Remove the strainer retaining bolt and lift out pump intake pipe and strainer assembly.
4. Remove and discard intake pipe O-ring and bottom pan gasket.
5. Using a screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring, Fig. 7-37.

CAUTION: Pressure regulator spring is under extreme pressure and will force valve bushing out of bore when snap ring is removed if valve bushing is not held securely.

6. Continue to exert pressure on valve bushing and remove snap ring, using Snap Ring Pliers, J-5403 (#21). Gradually release pressure on valve bushing until all spring force is exhausted.
7. Carefully remove regulator boost valve bushing and valve, and pressure regulator spring. Be careful not to drop parts, as they will fall out if they are not held.
8. Remove pressure regulator valve and spring retainer. Remove spacers if present. Be careful not to drop pressure regulator valve when removing it from bore.

b. Installation

1. Install spring retainer on pressure regulator spring. Also install spacers if previously removed.
2. Install pressure regulator valve on spring, stem end first.
3. Install boost valve into bushing, stem end out, and stack parts so that pressure regulator spring is against valve bushing.
4. Install complete assembly into pressure regulator valve bore, being careful not to drop parts during installation.
5. Using a screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring until it is beyond snap ring groove, and install snap ring using Snap Ring Pliers, J-5403 (#21), Fig. 7-37.

NOTE: To facilitate installation of snap ring, encircle it around screwdriver or steel rod, compress tangs with snap ring pliers, and slide snap ring upward into ring groove in valve bore.

6. Install new intake pipe O-ring onto intake pipe and install intake pipe and strainer assembly into transmission case bore, retaining strainer with retainer bolt.
7. Install new gasket on bottom pan and install bottom pan.
8. Install thirteen bottom pan attaching screws. Tighten screws to 12 foot-pounds.

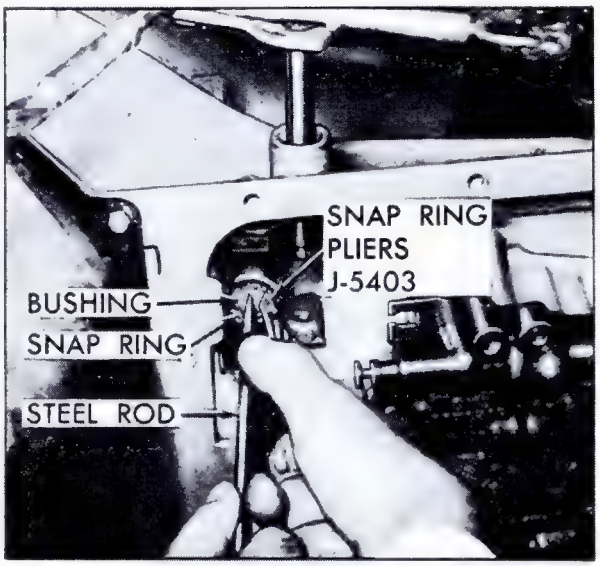


Fig. 7-37 Removing and Installing Pressure Regulator Valve

9. Lower car to floor and add fluid to transmission as required.

13. Transmission Removal and Installation

a. Removal

1. Disconnect negative battery cable.
2. Raise car on hoist or place on jack stands.
3. Disconnect relay rod from trunnion lever and wire relay rod up out of the way to prevent damage while removing transmission.
4. Remove two screws and bearing assembly from frame side rail.
5. Disconnect trunnion from manual yoke on left side of transmission.
6. Remove speedometer drive cable and disconnect detent wire.
7. Remove upper right transmission case to engine attaching screw (filler tube bracket screw).
8. Remove filler tube from transmission case and plug hole in case.
9. Disconnect oil cooler pipes at transmission using Oil Cooler Pipe Wrench, J-21477, Fig. 7-38. Cap pipes and plug connector holes in transmission. Position oil cooler pipes out of way.
10. Disconnect vacuum pipe hose from vacuum modulator and position vacuum pipe out of way. Remove clip at transmission screw.
11. Remove resonator support bracket from extension housing.
12. Remove propeller shaft as described in Section 4, Note 27a or 28a.
13. Remove two screws that hold starter motor to engine block. Remove starter motor bracket and slide starter forward.
14. Remove lower flywheel housing cover and exhaust brace.
15. Remove three converter to flex plate attaching bolts.

Fig. 7-38 Disconnecting Oil Cooler Pipes

NOTE: This is done by inserting a heavy screwdriver in open slot under one of the weld nuts on the converter, and rotating converter and flex plate until bolts can be reached for removal. Do not pry on flex plate ring gear or transmission case to rotate converter, as flex plate or case might be damaged.

16. Place jack or other suitable device under rear of engine.

17. Position transmission jack under transmission and raise it just enough to take the load off rear engine support.

18. Remove two rear engine mount to extension housing screws.

19. Remove four bolts, two each side, from rear engine support and remove support.

20. Remove five remaining transmission case to engine attaching screws. It may be necessary to lower engine and transmission slightly to gain access to upper attaching screws.

21. Move transmission toward rear of car, disengaging transmission case from locating dowels on engine, install Converter Holding Clamp, J-21366, on front of transmission case, Fig. 7-39 and lower transmission from car.

CAUTION: Converter Holding Clamp must be used when removing transmission, otherwise converter can fall out when transmission is removed.

22. Remove Converter Holding Clamp from transmission case and remove converter from turbine shaft.

CAUTION: Converter with oil weighs approximately fifty pounds. Be careful not to drop or damage converter when removing it.

b. Installation

1. Install converter on turbine shaft making certain that converter drive hub is fully engaged with pump gear tangs, and install Converter Holding Clamp, J-21366, on front of transmission case, Fig. 7-39.

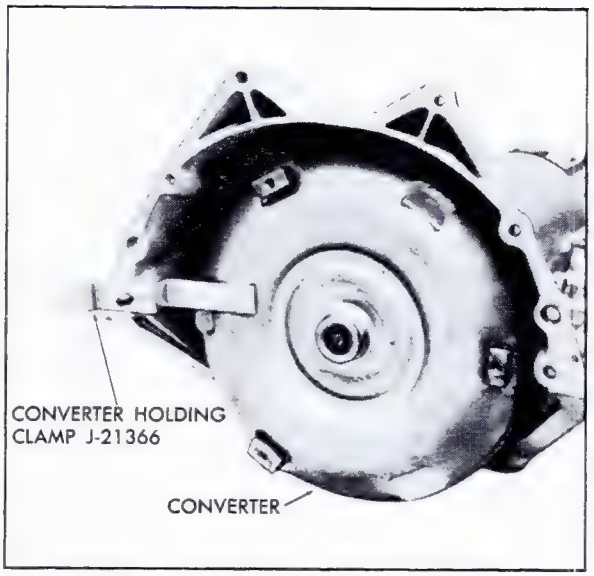


Fig. 7-39 Installing Convertor Holding Clamp

2. Place transmission on transmission jack and carefully raise into position. Remove Converter Holding Clamp.

3. Align front of transmission case with engine and dowel holes in transmission case with dowels on engine. Install five transmission case to engine attaching screws, tighten screws to 30 foot-pounds. Leave out filler tube bracket screw.

CAUTION: The procedure for attaching the converter to the flex plate as described in steps 4 through 6 must be strictly followed. Any deviation from this procedure will result in improper installation and damage to flex plate and transmission.

4. Rotate converter until two of the three weld nuts on converter line up with two bolt holes in flex plate. Position converter so that weld nuts are flush with flex plate. Make certain converter rotates freely in this position and is not cocked and that pilot in center of converter is properly seated in crankshaft.

5. Install two flex plate to converter attaching bolts through accessible bolt holes in flex plate and tighten finger tight.

Bolts must not be tightened at this time to assure proper alignment of converter.

6. Insert screwdriver under converter weld nut, rotate converter and flex plate and install third attaching bolt. Tighten all bolts to 28 foot-pounds. Do not pry on flex plate ring gear to rotate converter.

7. Install lower flywheel housing cover screws tightening screws to eight foot pounds.

8. Install exhaust brace and bolt, tightening nut or bolt to 15 foot-pounds.

9. Position starter motor to engine block and install two screws, tightening screws to 30 foot-pounds.

10. Install starter motor brackets, tightening screws to 23 foot-pounds.

11. Raise engine and transmission to about one inch above normal height and install rear engine support on frame. Install two bolts on each side, tighten bolts to 30 foot-pounds.

12. Lower transmission carefully and install two rear engine mount to extension housing screws. Tighten screws to 55 foot-pounds.

13. Remove jacks.

14. Install resonator support bracket to extension housing. Tighten screw to 35 foot-pounds.

15. Install speedometer cable and connect detent wire to transmission.

16. Connect trunnion to manual yoke left side of transmission, placing small amount of Lubriplate in slotted leg of yoke.

17. Install trunnion bearing assembly to left frame rail.

18. Attach relay rod to trunnion lever.

19. Install vacuum hose on modulator, making sure modulator pipe is fully engaged with modulator.

20. Clean ends of oil cooler pipes with solvent and connect pipes to transmission using Oil Cooler Pipe Wrench, J-21477, Fig. 7-38. Tighten nuts to 28 foot-pounds.

21. Unplug oil filler tube hole in transmission case. Using a new O-ring on filler tube, install filler tube to case.

22. Install filler tube bracket and modulator clip under upper right transmission case to engine screw. Tighten screw to 30 foot-pounds torque.

23. Install screw in filler tube bracket on right exhaust manifold. Tighten screw to 60 foot-pounds.

24. Install propeller shaft as described in Section 4, Note 27b or 28b.

25. Check operation of manual linkage. Adjust, if necessary, as described in Note 4.

26. Check brake pipes in area of cooler lines for possible damage.

27. Lower car and connect battery.

28. Add fluid to transmission as required.

14. Pump Oil Seal Replacement

1. Remove transmission assembly from car as described in Note 13a.

2. Use hammer to drive screwdriver or chisel under lip of oil seal and pry seal out of pump body, Fig. 7-40.

3. Before installing new seal, make certain bore is free from foreign material and that garter spring on seal is correctly positioned. Also check finish of converter neck and bearing surface in pump body.

NOTE: Use a non-hardening sealer on outside of seal body before installing seal.

4. Install new seal in pump body using Pump Oil Seal Installer, J-21359, Fig. 7-41.

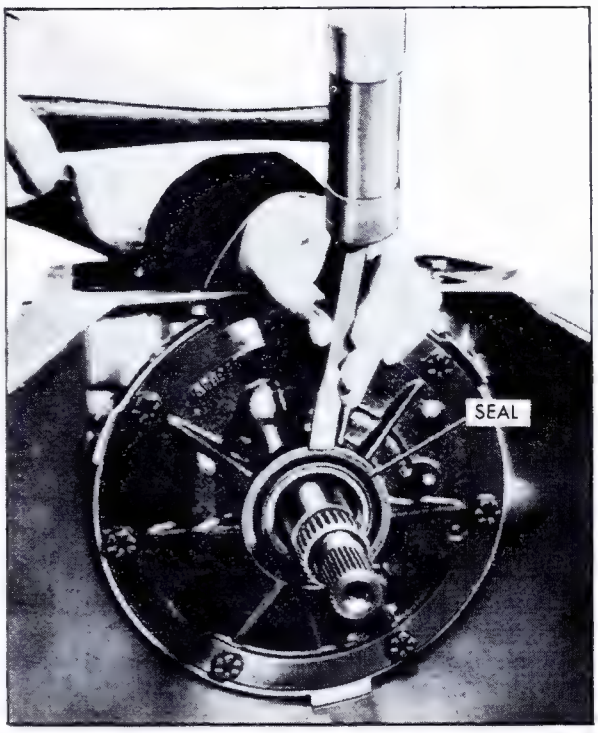


Fig. 7-40 Removing Pump Oil Seal

5. Install transmission assembly in car as described in Note 13b.

15. Converter

1. Remove transmission from car as described in Note 13a and remove converter from transmission.

2. Perform visual inspection as follows:

a. Inspect converter for visual signs of damage.

b. Inspect for wrong converter.

c. Inspect neck of converter for wear.

d. Inspect pump drive slots for signs of excessive wear.

3. Insert valve, part of Converter Leak Test Fixture, J-21369, in neck of converter and back-off large hex nut.

4. Install leak test fixture band crosswise on converter so that slotted plate fits around valve and under nut. Fig. 7-42. Tighten nut to expand O-ring and secure a good seal.

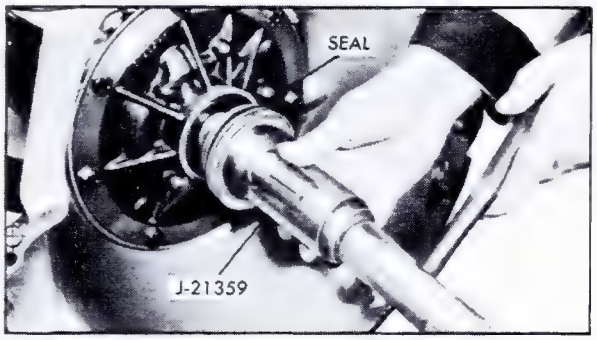


Fig. 7-41 Installing Pump Oil Seal

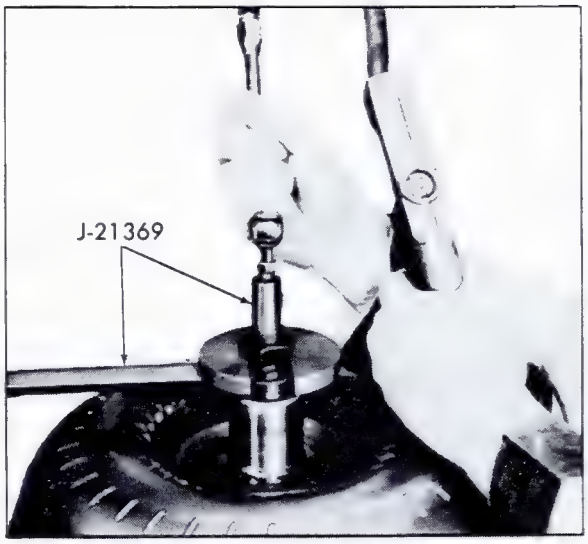


Fig. 7-42 Leak Checking Converter

5. Apply compressed air with a service air hose until approximately 80 to 100 psi air pressure is obtained.

6. Immerse assembly in water, noting any sign of bubbles that would indicate a leak.

7. Depress valve stem to release air pressure in converter and then remove leak test fixture band and valve.

CAUTION: Always release air pressure before removing valve, as a definite hazard exists should valve blow out during removal.

8. Thoroughly dry converter and install converter in transmission as follows:

a. Place transmission in Holding Fixture, J-8763-01 and install Holding Fixture in Holding Fixture Base, J-3289-20, so that transmission is positioned vertically with pump end up.

b. Carefully position converter on turbine shaft, making certain converter is properly aligned.

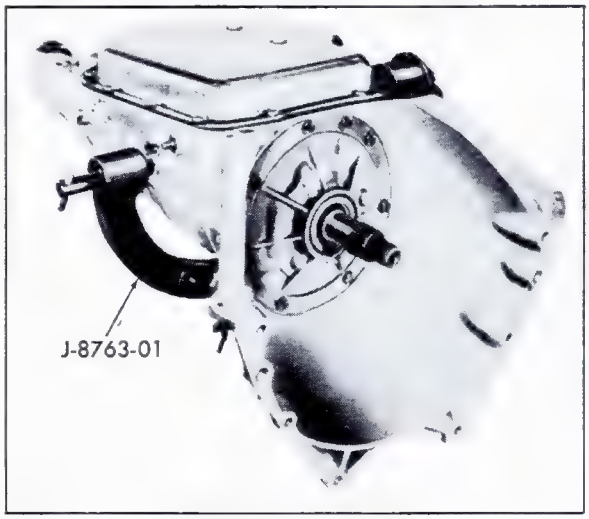


Fig. 7-43 Transmission in Holding Fixture

Long screws or eyebolts can be threaded into the weld nuts on the converter and used as handles.

c. Rotate converter until the shafts are piloted and the converter lugs are indexed in the pump gear.

d. If difficulty is experienced in alignment, tap on outer diameter of converter with plastic-headed hammer, while turning converter.

9. Install transmission as described in Note 13b.

16. Major Transmission Components—Removal (Fig. 7-1)

a. Remove Vacuum Modulator and Valve

NOTE: Unit may be removed without removing transmission or bottom pan.

1. Remove converter from transmission and install Holding Fixture, J-8763-01, on transmission so that vacuum modulator will be located on side of Holding Fixture nearest the bench. Install fixture and transmission into Holding Fixture Base, J-3289-20, with bottom pan facing up, Fig. 7-43, and install lock pin in base. Provide container to catch any oil that may drain from transmission.

2. Remove vacuum hose from modulator.

3. Remove vacuum modulator attaching screw and retainer from transmission case.

4. Remove modulator assembly and O-ring from case. Discard O-ring.

5. Remove modulator valve from transmission case.

b. Remove Governor Assembly

NOTE: Unit may be removed without removing transmission or bottom pan.

1. Remove four attaching screws, governor cover, and gasket. Discard gasket.

2. Remove governor assembly by pulling straight out of case.

c. Remove Speedometer Driven Gear Assembly

NOTE: Unit may be removed without removing transmission or bottom pan, after removing speedometer cable from driven gear assembly.

1. Remove attaching screw and retainer from left side of case. Apply slight pressure to remove sleeve and speedometer driven gear.

d. Remove Intake Pipe and Strainer Assembly and Bottom Pan

NOTE: Unit may be removed with transmission in car. In cases of transmission failure, strainer must be replaced.

1. Remove bottom pan attaching screws.

2. Remove bottom pan and gasket. Discard gasket. Drain oil from pan if transmission is in car.

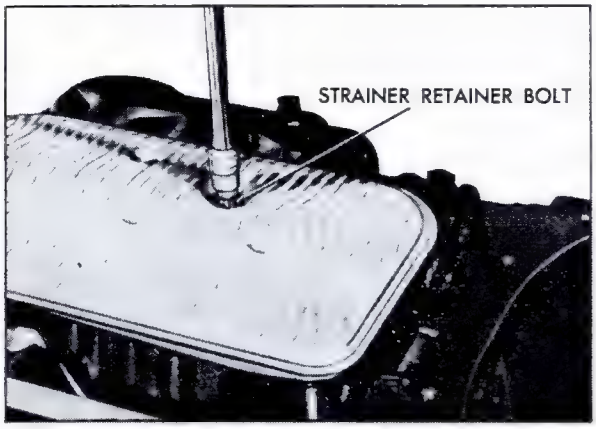


Fig. 7-44 Removing Strainer Retainer Bolt

3. Remove strainer retainer bolt, Fig. 7-44.
4. Lift out pump intake pipe and strainer assembly, Fig. 7-45.
5. Remove intake pipe from strainer and discard strainer.
6. Remove and discard intake pipe O-ring.

e. Remove Control Valve Assembly, Governor Pipes, and Detent Spring and Roller Assembly

NOTE: Units may be removed with transmission in car, after removing bottom pan and draining fluid.

1. Remove attaching screw and remove detent spring and roller assembly.
2. Remove ten remaining control valve assembly attaching screws. Do not remove solenoid attaching screws at this time.
3. Remove control valve assembly with the two governor pipes attached, Fig. 7-46.

CAUTION: Do not allow manual valve to fall out of its bore in control valve assembly. Be careful not to drop front servo piston if it should come out with control valve assembly.

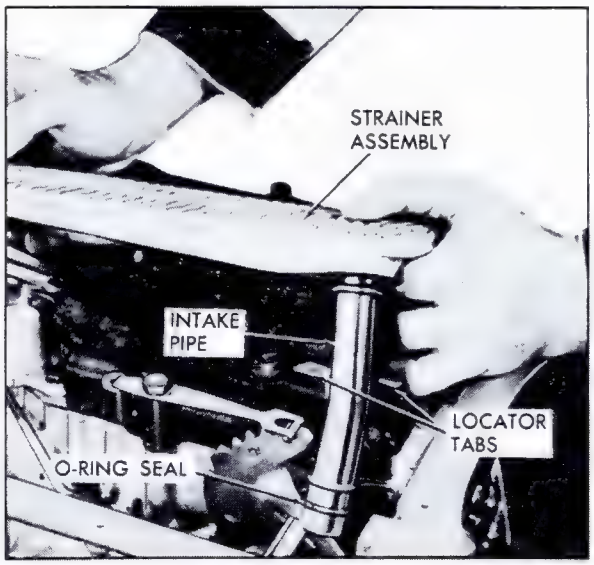


Fig. 7-45 Removing Intake Pipe and Strainer Assembly

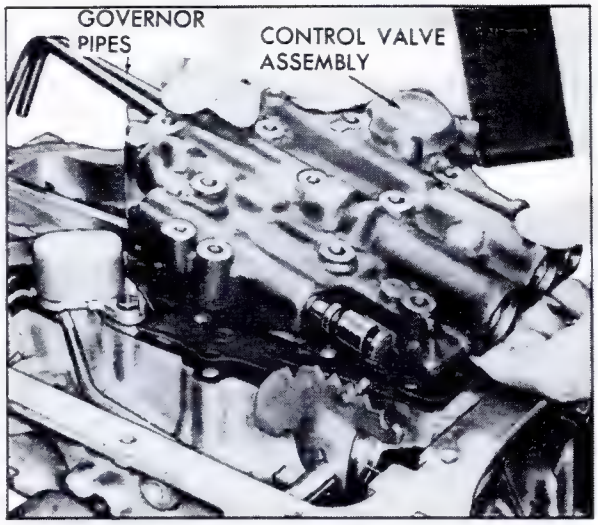


Fig. 7-46 Removing Control Valve Assembly

4. Remove governor pipes from valve body. Governor pipes are interchangeable and need not be identified.
5. Remove control valve assembly to spacer gasket. Discard gasket.

f. Remove Rear Servo Assembly

NOTE: Unit may be removed with transmission in car after removing bottom pan and allowing fluid to drain. Remove control valve assembly, and governor pipes (Note 16e).

1. Remove six rear servo cover attaching screws, servo cover, and gasket. Discard gasket.
2. Remove rear servo assembly from transmission case, Fig. 7-47.
3. Remove servo accumulator spring.
4. Make band apply pin selection check to determine proper size pin to use at time rear servo is assembled. Proceed as follows:

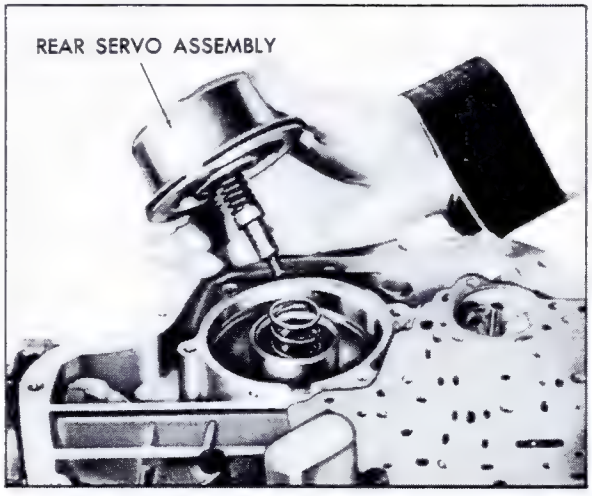


Fig. 7-47 Removing Rear Servo Assembly

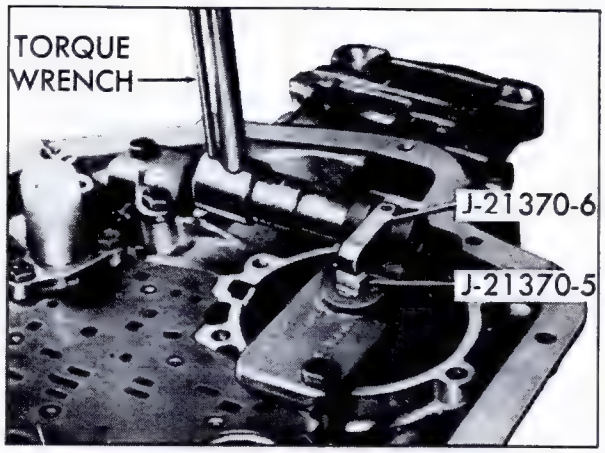


Fig. 7-48 Band Apply Pin Selection Check

g. Band Apply Pin Selection Check

NOTE: Check may be made with transmission in car. Remove bottom pan and allow fluid to drain. Remove control valve assembly, governor pipes (Note 16e) and rear servo (Note 16f).

1. Position Band Apply Pin Selector Gage, J-21370-6, on transmission case over rear servo bore, with hex nut on side of gage facing toward parking brake linkage, and smaller diameter end of Gage Pin, J-21370-5, in servo pin bore, Fig. 7-48.

2. Secure gage with two 5/16-18 x 1 inch screws, tightening screws to 18 foot-pounds. Make certain that stepped gage pin is free to move up and down in both tool and servo pin bore. Stepped side of pin must face front of transmission case.

Band apply pins are available in three sizes as shown in the following chart:

IDENTIFICATION	LENGTH
Three Rings	Long
Two Rings	Medium
One Ring	Short

Identification ring is located on band lug end of pin. Selecting the proper pin is equivalent to adjusting band.

3. To determine proper size pin to use, apply 25 foot-pounds torque on hex nut on side of gage, Fig. 7-48. This will cause lever on top of gage to depress stepped gage pin into servo pin bore, simulating actual operating conditions. Note relation of steps on gage pin and machined surface on top of gage. Determine proper size pin as follows:

a. If machined surface on top of gage is even with or above upper step on gage pin, long size pin (three rings) is required.

b. If machined surface on top of gage is between upper and lower steps on gage pin, medium size pin (two rings) is required.

c. If machined surface on top of gage is even with or below step on gage pin, short size pin (one ring) is required.

4. If new pin is required, make note of pin size required, and remove gage from transmission case.

Fig. 7-49 Removing Detent Solenoid Wire

h. Remove Detent Solenoid, Solenoid Connector, Control Valve Spacer, Gaskets, Check Balls, and Front Servo Assembly

NOTE: Units may be removed with transmission in car. Remove bottom pan and drain transmission fluid. To remove control valve spacer, gaskets, check balls, and front servo, remove control valve assembly and governor pipes (Note 16e).

1. Disconnect detent solenoid lead from case connector terminal, Fig. 7-49.

2. Compress tabs on case connector and remove connector and O-ring from case. Discard O-ring.

3. Remove two detent solenoid attaching screws and remove solenoid assembly and gasket.

4. Remove control valve spacer plate and gasket from case.

NOTE: If operation is being performed on car, lower control valve spacer plate in a level plane so that check balls don't fall out. Then remove check balls from spacer plate.

5. Remove six check balls from cored passages in transmission case.

6. Lift front servo piston, washer, pin, retainer and spring out of transmission case.

i. Remove Rear Oil Seal and Extension Housing

NOTE: Units may be removed with transmission in car. See Notes 10 and 11.

1. If required, use hammer to drive screwdriver under oil seal flange and pry seal out of extension housing.

2. Remove six extension housing attaching screws and remove extension housing.

3. Remove and discard gasket from extension housing.

j. Front Unit End Play Checking Procedure

NOTE: Transmission must be removed from car. (Note 13a)

1. Remove one oil pump attaching screw and rubber-coated washer at either 10 o'clock or 5 o'clock position.

2. Install Slide Hammer Bolt, J-6125-1, and Adapter, J-6125-2, in screw hole where attaching screw was removed.

3. Mount Dial Indicator, J-8001, on slide hammer bolt and index indicator to register with flat surface on end of turbine shaft.

4. Hold output shaft forward while pushing turbine shaft rearward to its stop.

5. Set dial indicator to zero.

6. Pull turbine shaft forward, Fig. 7-50.

Note resulting travel or end play for selection of washer for use at time of transmission assembly. End play should be .003 inch- .024 inch. The selective washer controlling this end play is the phenolic resin washer located between pump cover and forward clutch housing. If more or less washer thickness is required to bring end play within specifications, select proper washer from the following chart.

THICKNESS (INCH)	COLOR
.060 - .064	Yellow
.071 - .075	Blue
.082 - .086	Red
.093 - .097	Brown
.104 - .108	Green
.115 - .119	Black
.126 - .130	Purple

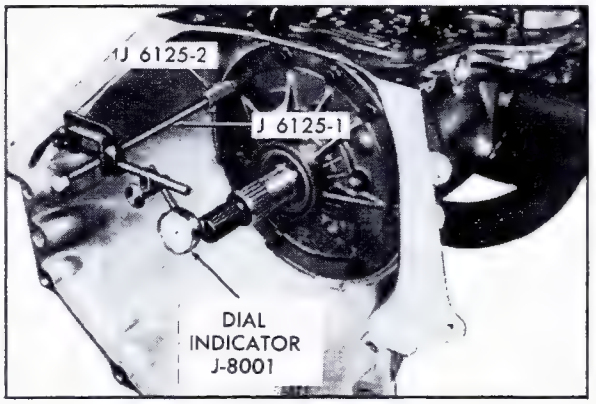


Fig. 7-50 Front Unit End Play Check

NOTE: An oil-soaked washer may tend to discolor. If necessary, measure washer for thickness.

7. Remove dial indicator. If oil pump is to be removed, do not remove slide hammer assembly at this time.

k. Remove Oil Pump

NOTE: For removing oil pump only, transmission must be removed from car (Note 13a).

1. If not done previously, perform the following steps:

a. Remove one oil pump attaching screw and rubber-coated washer at either 10 o'clock or 5 o'clock position.

b. Install Slide Hammer Bolt, J-6125-1, and Adapter, J-6125-2, in screw hole where attaching screw was removed.

2. Remove other seven pump attaching screws and washers.

3. Install Slide Hammer Bolt, J-6125-1, and Adapter, J-6125-2, into other threaded hole at 10 o'clock or 5 o'clock position in pump body and drive outward with slide hammers to remove pump assembly from transmission case, Fig. 7-51.

CAUTION: Drive outward in unison on both slide hammer assemblies to prevent cocking pump assembly in case.

Fig. 7-51 Removing Pump Assembly

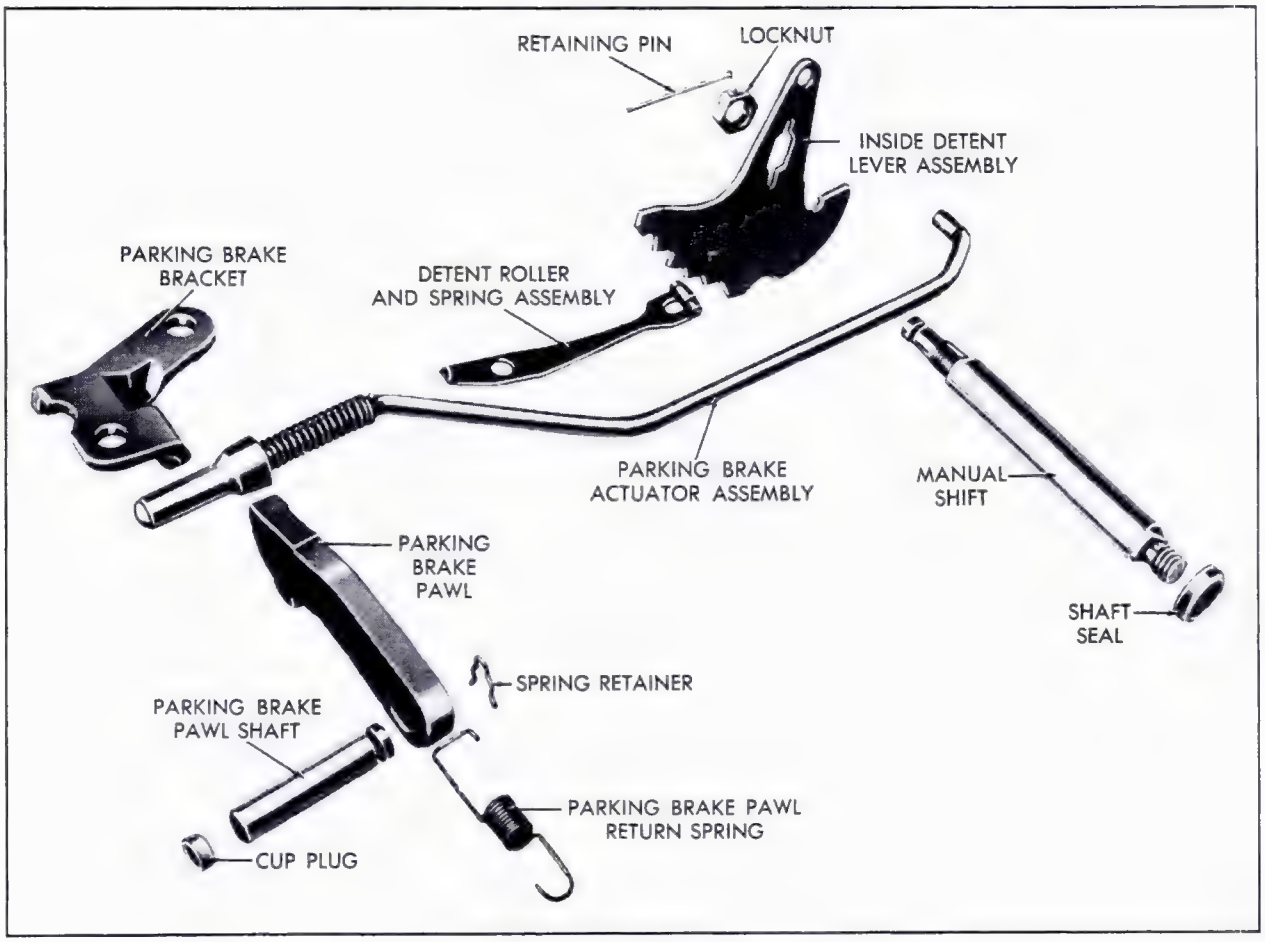


Fig. 7-52 Manual and Parking Linkage Disassembled

4. Remove slide hammer assemblies from pump.
5. Remove and discard pump square cut O-ring and gasket.

l. Remove Detent Lever, Manual Shaft, and Parking Linkage (Fig. 7-52)

NOTE: Units may be removed with transmission in car. Drain transmission fluid by removing bottom pan. Remove manual linkage from manual lever and remove detent spring and roller assembly from control valve assembly.

1. Remove pin securing manual shaft to case.

NOTE: If procedure is being performed on car, bend pin to remove it.

2. Loosen locknut securing inside detent lever to manual shaft.
3. Pry or work inside detent lever loose from manual shaft and remove locknut.
4. Remove manual shaft, parking actuator rod and detent lever from case.

NOTE: Do not remove manual shaft seal unless replacement is required.

5. Remove parking brake bracket attaching screws and remove bracket.
6. Remove parking pawl return spring.

NOTE: The following steps are to be completed only if one or more of the parts involved require replacement.

7. Remove spring retainer from parking pawl shaft.
8. Remove parking brake pawl shaft cup plug by placing screwdriver between parking pawl shaft and case rib and prying outward, Fig. 7-53.
9. Remove parking pawl shaft and parking pawl.

m. Remove Turbine Shaft, Forward Clutch Housing, Direct Clutch Assembly, Sun Gear Shaft, and Front Band

NOTE: Transmission must be removed from car (Note 13a). Requires removal of oil pump (Note 16k).

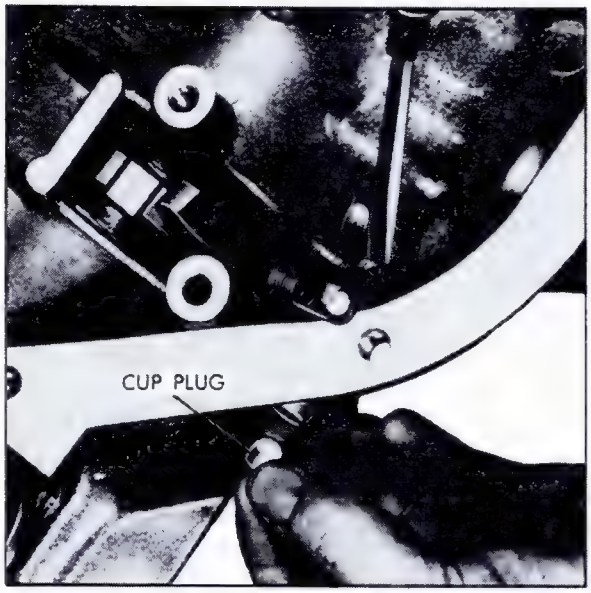


Fig. 7-53 Removing Cup Plug

1. Remove turbine shaft and forward clutch assembly from transmission, Fig. 7-54.
2. Remove forward clutch hub to direct clutch housing thrust washer if it did not come out with forward clutch assembly.
3. Remove direct clutch and intermediate sprag assembly, Fig. 7-55. Sun gear shaft may come out with direct clutch assembly.
4. Remove sun gear shaft if not previously removed.
5. Remove front band assembly.

NOTE: Check rear unit end play at this time. Proceed as follows:

n. Rear Unit End Play Checking Procedure

NOTE: Transmission must be removed from car (Note 13a). Requires removal of extension housing.

1. Install Speedometer Puller Bolt, J-21797,

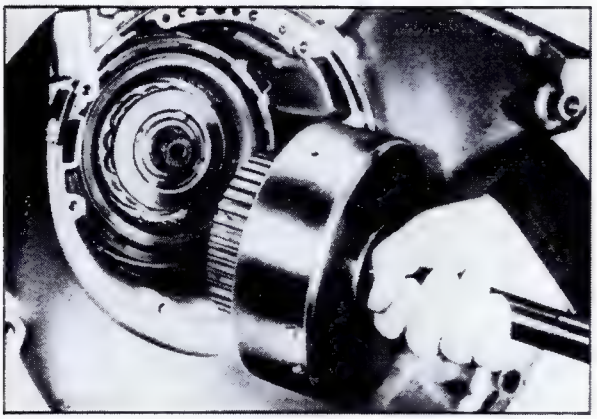


Fig. 7-54 Removing Forward Clutch Assembly

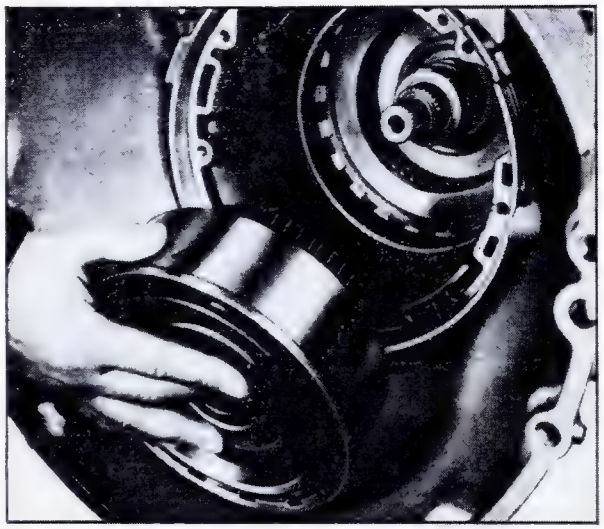


Fig. 7-55 Removing Direct Clutch and Intermediate Sprag Assembly

in one of the bolt holes on end of transmission case.

2. Mount Dial Indicator, J-8001, on Bolt, J-21797, and index indicator to register with flat surface on end of output shaft, Fig. 7-56.

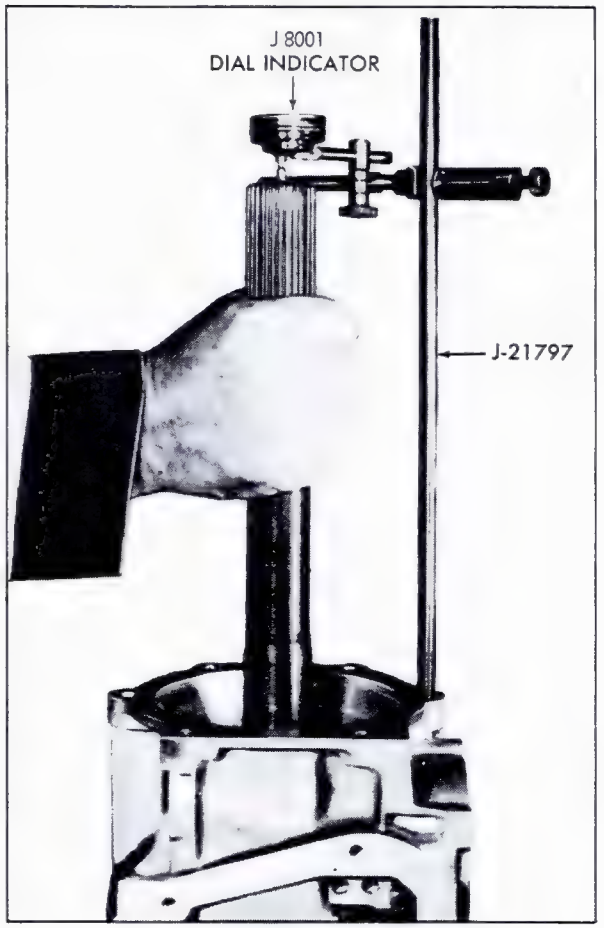


Fig. 7-56 Checking Rear Unit End Play

3. Set dial indicator to zero.

4. Move output shaft in and out. Note resulting travel or end play for selection of washer for use at time of transmission assembly. End play should be .003 inch - .019 inch.

The selective washer controlling this end play is the steel washer with the three tabs, located between thrust washer and rear face of transmission case. Notches and/or numerals on the tabs serve to identify washer thickness.

If a different washer thickness is required to bring end play within specifications, it can be selected from the following chart. The tabs will show identification notches, numerals, or both.

THICKNESS (INCH)	IDENTIFICATION NOTCH AND/OR NUMERAL	
.074 - .078	None	1
.082 - .086	On Side of 1 Tab	2
.090 - .094	On Side of 2 Tabs	3
.098 - .102	On End of 1 Tab	4
.106 - .110	On End of 2 Tabs	5
.114 - .118	On End of 3 Tabs	6

o. Remove Remaining Components

NOTE: Transmission must be removed from car (Note 13a). Requires removal of bottom pan, control valve assembly and governor pipes (Note 16e) rear servo assembly (Note 16f), control valve spacer, gaskets, check balls and front servo assembly (Note 16h), oil pump (Note 16k), turbine shaft, forward clutch housing, direct clutch assembly, sun gear shaft and front band (Note 16m).

1. Remove center support bolt from transmission case using 3/8 inch 12-point thin wall deep socket.

2. Remove intermediate clutch backing plate to case snap ring.

3. Remove intermediate clutch backing plate, and three composition and three steel clutch plates.

4. Using needle nose pliers, or screwdriver, remove center support to case snap ring.

5. Install Tool, J-21795, on end of main shaft so that tangs engage groove in shaft. Tighten screw on tool to secure tool on shaft and prevent movement of roller clutch during removal of gear unit assembly.

6. Install proper diameter length of pipe over output shaft to be used as a handle and to prevent spline damage to case bushing when removing gear unit, center support, and reaction carrier.

NOTE: Loosen transmission holding fixture pivot pin slightly, so that gear unit assembly does not bind when it is removed from case.

7. With transmission case in a horizontal position, shift complete assembly toward front of case to facilitate removal of assembly from case. Remove complete gear unit assembly from case.

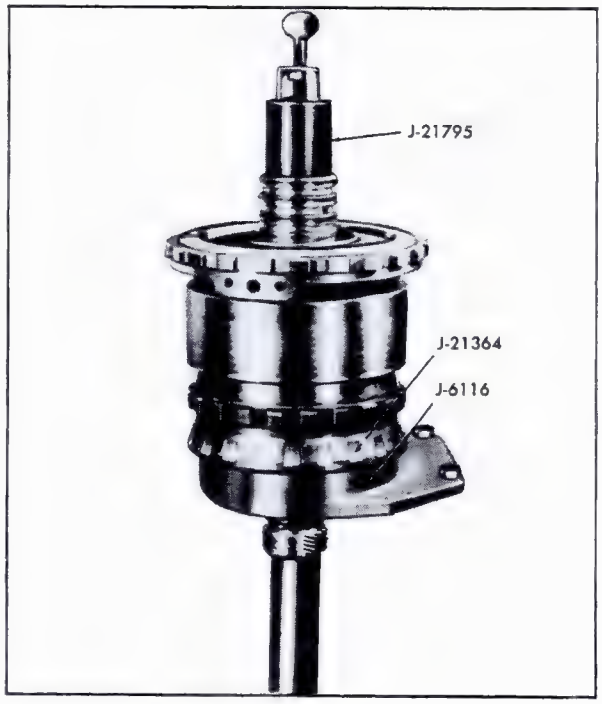


Fig. 7-57 Gear Unit in Holding Fixture

CAUTION: Be careful not to drop or bump assembly in transmission case during removal. This could result in damage to output shaft bushing in case as well as to assembly itself.

8. Remove output shaft to case thrust washer from output shaft or case.

9. Using Adapter, J-21364, in Rear Unit Holding Fixture, J-6116, place gear unit assembly in holding fixture with main shaft pointing upward, Fig. 5-57. Remove Tool J-21795.

10. Remove rear unit selective washer from transmission case.

Fig. 7-58 Removing Center Support to Reaction Carrier Thrust Washer

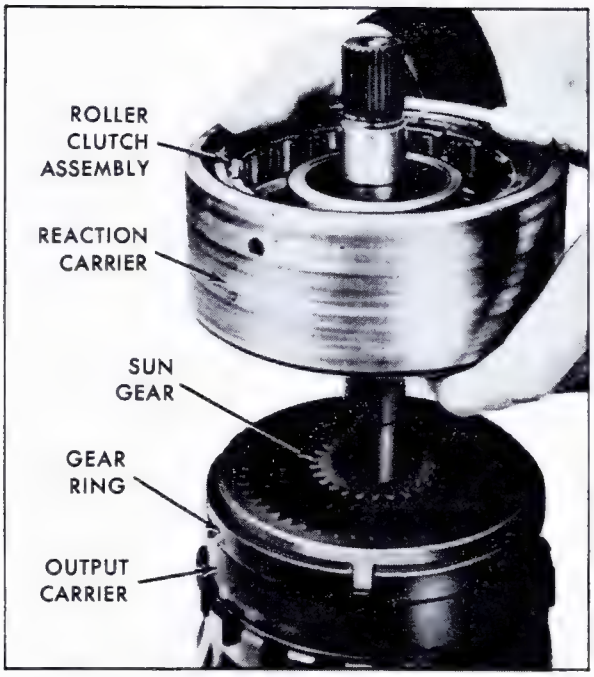


Fig. 7-59 Removing Reaction Carrier and Roller Clutch Assembly

11. Remove rear band assembly. To facilitate removal, rotate band lugs away from pins and pull band assembly out of transmission case.

12. Remove center support assembly from reaction carrier by lifting straight upward.

13. Remove center support to reaction carrier thrust washer, Fig. 7-58.

NOTE: Thrust washer may have stuck to back of center support. If so, remove from center support.

14. Remove reaction carrier and roller clutch assembly from output carrier, Fig. 7-59, and remove roller clutch assembly from reaction carrier.

17. Transmission Disassembly, Cleaning, Inspection and Assembly of Individual Units

Inspect each part thoroughly after the transmission and individual units have been disassembled and cleaned, to determine which parts should be replaced. It is very important to distinguish between parts that are simply "worn-in" and those parts worn to the extent that they affect operation of the unit. Only "worn-out", broken or damaged parts should be replaced.

a. Inspection of Torque Converter

1. Check converter for leaks as described in Note 15.

2. Check converter hub surfaces for signs of scoring or wear.

b. Inspection of Vacuum Modulator and Valve

1. Inspect vacuum modulator for any signs of bending or distortion.

2. Inspect O-ring seat for damage.

3. Inspect modulator valve for nicks or damage.

4. Check freeness of valve operation in case bore.

5. Check modulator for damaged bellows. Modulator plunger is under approximately 16 pounds pressure. If bellows is damaged, plunger will have very little pressure. Use procedure outlined in Note 1f.

c. Inspection of Extension Housing

1. Inspect bushing and rear seal for excessive wear or damage.

2. Inspect gasket mounting face for damage.

3. Inspect housing for cracks or porosity.

4. Be sure rear seal drain back port is not blocked.

d. Inspection of Detent Lever, Manual Shaft, and Parking Linkage

1. Inspect parking actuator rod for cracks, or broken spring retainer lugs.

2. Inspect actuator spring for damage.

3. Inspect actuator for a free fit on actuator rod.

4. Inspect parking pawl for cracks or wear.

5. Inspect manual shaft for damaged threads.

6. Inspect inside detent lever for cracks or a loose pin.

7. Inspect parking pawl return spring for deformed coils or ends.

8. Inspect parking bracket for cracks or wear.

9. Inspect detent spring and roller assembly.

e. Inspection of Transmission Case

1. Inspect case assembly for cracks, porosity or interconnected passages, Fig. 7-26 and 7-27.

2. Check for good retention of band anchor pins.

3. Inspect all threaded holes for thread damage.

4. Inspect intermediate clutch driven plate lugs for damage or brinelling.

5. Inspect snap ring grooves for damage.

6. Inspect governor assembly bore for scratches or scoring.

7. Inspect modulator valve bore for scoring or damage.

8. Inspect cup plug inside case for good staking and sealing.

f. Governor Assembly (Fig. 7-60)

All components of the governor assembly, with the exception of the driven gear, are a select fit and each assembly is calibrated. The governor, including the driven gear, is serviced as a complete assembly. However, the driven gear can also be serviced separately.

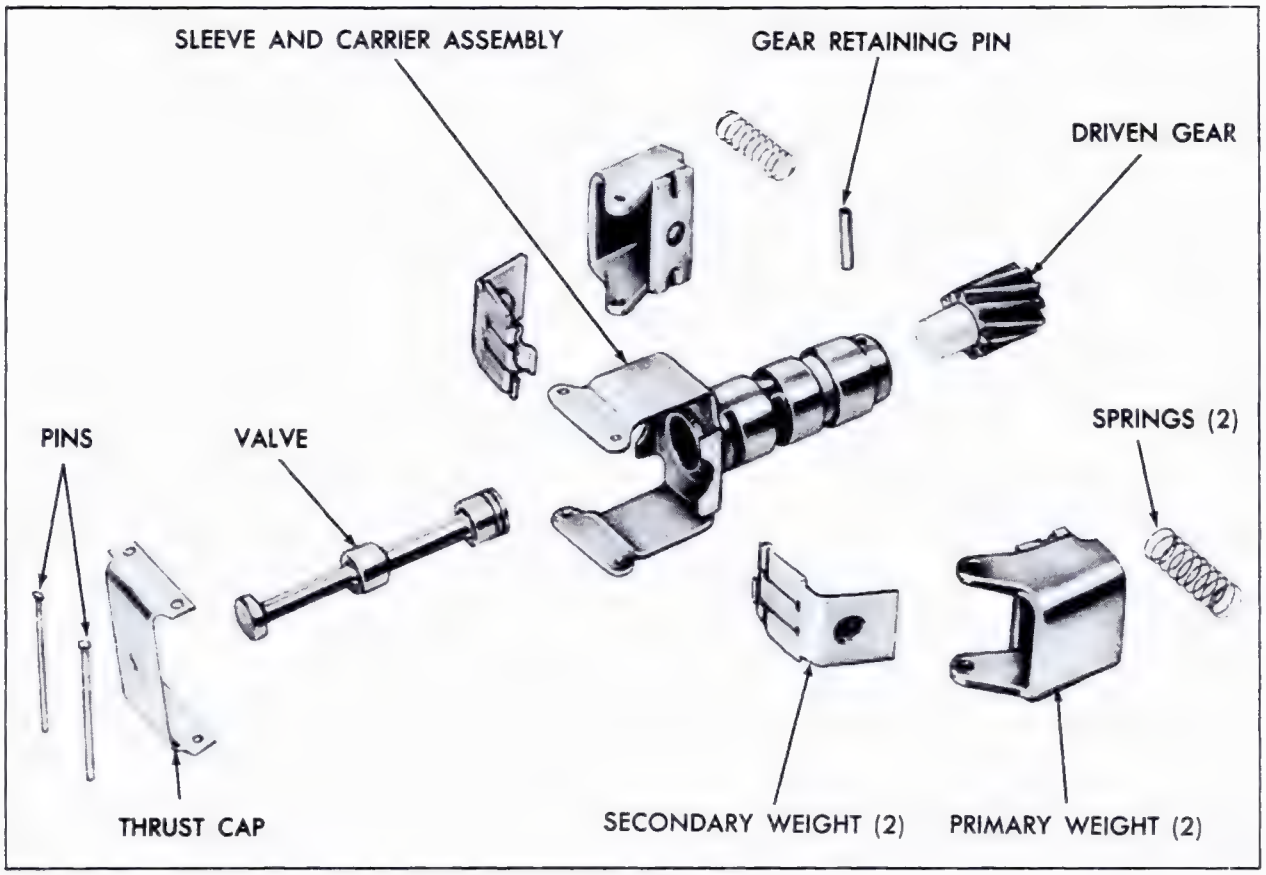


Fig. 7-60 Governor Assembly Disassembled

It is necessary to disassemble the governor assembly in order to replace the driven gear. Disassembly may also be necessary due to foreign material causing improper operation. In such cases, proceed as follows:

Disassembly

1. Cut off one end of each governor weight pin and remove pins, governor thrust cap, governor weights, and springs. Governor weights are interchangeable from side to side and need not be identified.
2. Remove governor valve from governor sleeve. Be careful not to damage valve.
3. Perform the following inspections and replace governor driven gear if necessary.

Inspection

1. Wash all parts in cleaning solvent, air dry and blow out all passages.
2. Inspect governor sleeve for nicks, burrs, scoring or galling.
3. Check governor sleeve for free operation in bore of transmission case.
4. Inspect governor valve for nicks, burrs, scoring or galling.
5. Check governor valve for free operation in bore of governor sleeve.
6. Inspect governor driven gear for nicks, burrs, or damage.
7. Check governor driven gear for looseness on governor sleeve.
8. Inspect governor springs for distortion or damage.
9. Check governor weights for free operation in their retainers.
10. Check valve opening at entry (.020" minimum) with a feeler gage, holding governor as shown with governor weights extended completely outward, Fig. 7-61.
11. Check valve opening at exhaust (.020" minimum) with a feeler gage, holding governor as shown with governor weights completely inward, Fig. 7-62.

Governor Driven Gear Replacement

To facilitate governor repair in the field, a governor driven gear and replacement pins are available for service use. The service package contains a nylon driven gear, two governor weight retaining pins and one governor gear retainer split pin. Replacement of gear must be performed with care in the following manner:

1. Drive out governor gear retaining split pin using small punch, Fig. 7-63.
2. Support governor on 3/16 inch plates installed in exhaust slots of governor sleeve, place in arbor press and, with a long punch, press gear out of sleeve.
3. Carefully clean governor sleeve of chips that remain from original gear installation.

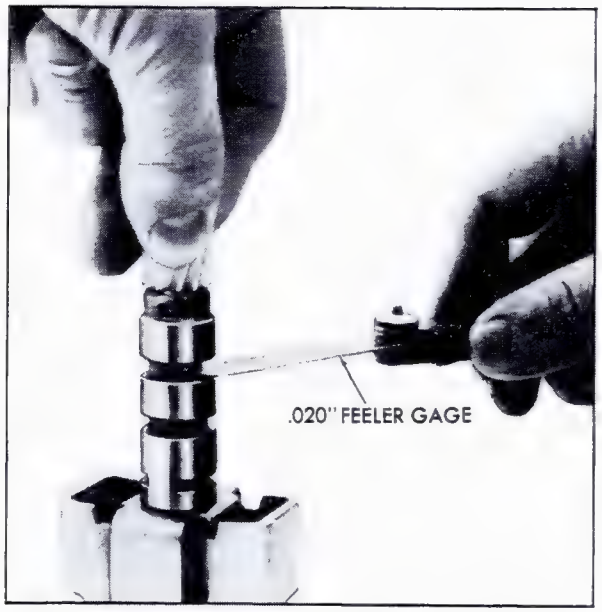


Fig. 7-61 Checking Valve Opening - Weights Extended

4. Support governor on 3/16 inch plates installed in exhaust slots of sleeve, position new gear in sleeve and, with a suitable socket, press gear into sleeve until nearly seated. Carefully remove any chips that may have shaved off gear hub and press gear in until it bottoms on shoulder.

5. A new pin hole must be drilled through sleeve and gear. Locate hole position 90° from existing hole, center punch, and then while supporting governor in press, drill new hole through sleeve and gear using a 1/8 inch drill.

6. Install split retainer pin.

7. Wash governor assembly thoroughly to remove any chips that may have collected.

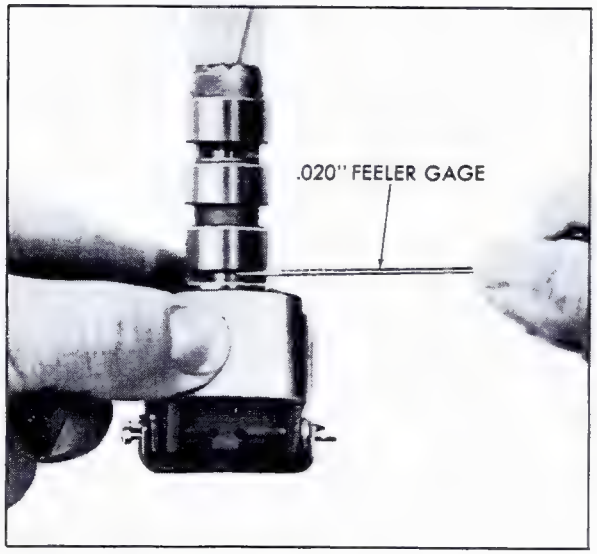


Fig. 7-62 Checking Valve Opening - Weights Inward

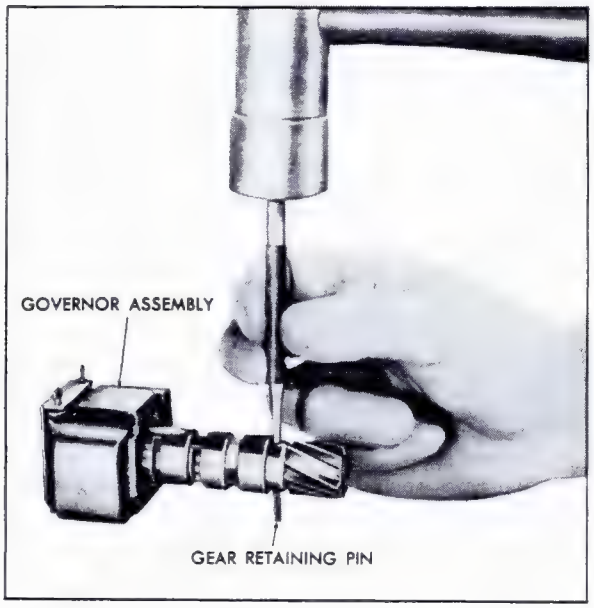


Fig. 7-63 Removing Governor Driven Gear Retaining Pin

Assembly

1. Install governor valve in bore of governor sleeve.
2. Install governor weights and springs, and thrust cap on governor sleeve.
3. Align pin holes in thrust cap, governor weight assemblies, and governor sleeve, and install new pins. Crimp both ends of pins to prevent them from falling out.
4. Check governor weight assemblies for free operation on pins and valve for freeness in sleeve bore.

g. Speedometer Driven Gear Assembly

Disassembly

1. Remove speedometer driven gear from sleeve.
2. Remove O-ring from speedometer driven gear sleeve.
3. Remove C-wire ring retaining sleeve to gear lip seal.
4. Remove lip seal.

Inspection

1. Inspect gear for damaged teeth or shaft.
2. Inspect sleeve for scores, damaged threads or cracks.
3. Inspect seals for cuts or damage.

Assembly

1. Install sleeve to gear lip seal.

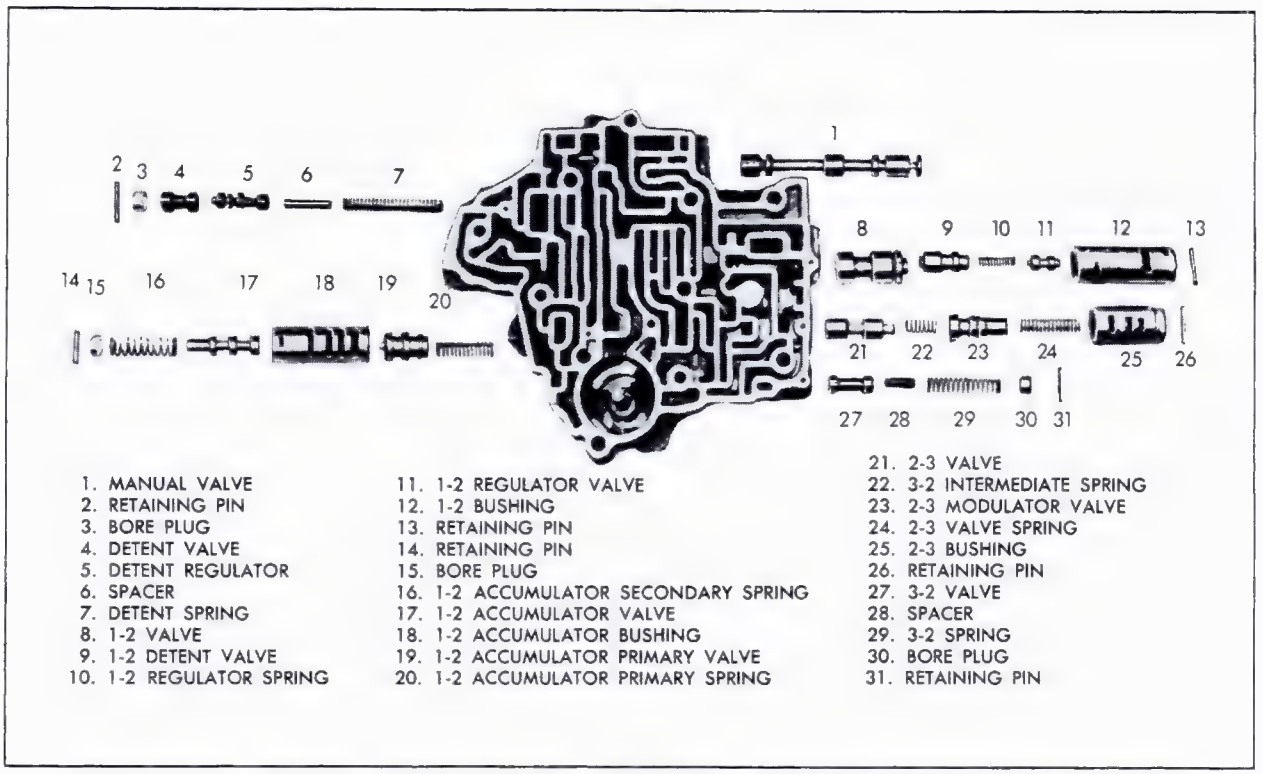


Fig. 7-64 Control Valve Assembly Disassembled

2. Install C-wire retaining ring.
3. Install O-ring on speedometer driven gear sleeve.
4. Install gear in sleeve.

h. Control Valve Assembly (Fig. 7-64)

Disassembly

When disassembling control valve, make certain that springs are accurately identified so that they can be properly reassembled.

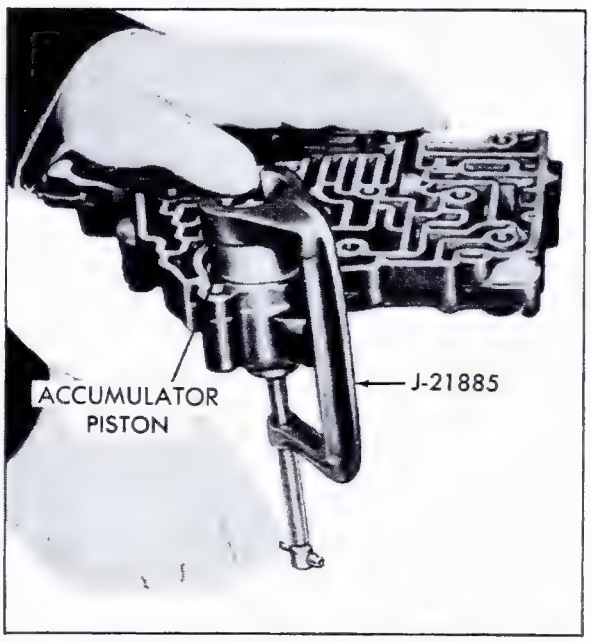


Fig. 7-65 Removing Front Accumulator Piston

1. Position control valve assembly with cored face up and accumulator pocket on bottom.
2. Remove manual valve from upper bore.
3. Install Control Valve Accumulator Piston Installer, J-21885, on accumulator piston, compress piston and remove E-ring retainer, Fig. 7-65.
4. Remove Installer, J-21885, and remove accumulator piston and spring.
5. Using pin punch, remove retaining pin from upper right bore, pressing on pin from outer side of valve body. Remove 1-2 modulator bushing, 1-2 regulator valve and spring, 1-2 detent valve and 1-2 shift valve from upper right bore.

NOTE: 1-2 regulator valve and spring may be inside of 1-2 modulator bushing.

6. Using pin punch, remove retaining pin from center right bore, pressing on pin from outer side of valve body. Remove 2-3 modulator bushing, 2-3 shift valve spring, 2-3 modulator valve, 3-2 intermediate spring and 2-3 shift valve from center right bore.

NOTE: 2-3 modulator valve will be inside of 2-3 modulator bushing.

7. Using pin punch, remove retaining pin from lower right bore, pressing on pin from outer side of valve body.

CAUTION: Hold hand over bore when removing retainer pin as 3-2 valve spring may force bore plug out.

8. Remove bore plug, 3-2 valve spring, spacer and 3-2 valve from lower right bore.
9. Using pin punch, remove retainer pin from upper left bore by pressing on outer side of valve body.

CAUTION: Hold hand over bore when removing retainer pin as detent regulator valve spring may force other components out of bore.

10. Remove bore plug, detent valve, detent regulator valve, spacer and detent regulator valve spring from upper left bore.
11. Remove grooved retaining pin from lower left bore by prying out with long nose pliers.
12. Remove bore plug, 1-2 accumulator bushing, 1-2 accumulator valve and secondary spring from lower left bore.
13. From the same bore remove the primary 1-2 accumulator valve and spring.
14. Remove governor oil feed screen assembly from governor oil feed hole in control valve body, Fig. 7-66.

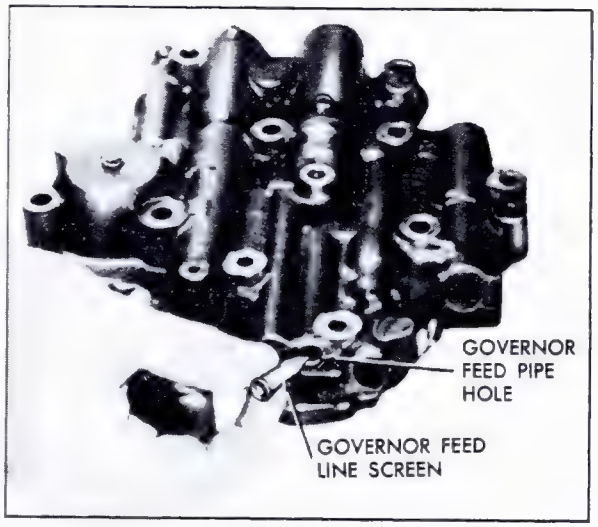


Fig. 7-66 Removing Governor Feed Line Screen

Inspection

1. Wash control valve body, valves, and other parts in clean solvent.

CAUTION: Do not allow valves to bump together, as this might cause nicks and burrs.

2. Inspect all valves and bushings carefully to make sure that they are free from dirt and are not damaged in any respect. If burrs are present, they should be removed with a fine stone or fine grade of crocus cloth and light oil. Be careful not to round off shoulders of valves.
3. All valves and bushings should be tested in their individual bores to make certain that free movement can be obtained. All valves should fall freely of their own weight with a slight tapping action on the body. In checking, be careful to prevent valve damage in any way.
4. The manual valve is the only valve that can be serviced separately. If other valves are defective or damaged beyond repair, a new control valve assembly should be installed.
5. Inspect body for cracks or scored bores.
6. Check all springs for distortion or collapsed coils.

Assembly

1. Position front accumulator spring and piston into valve body.
2. Install Control Valve Accumulator Piston Installer, J-21885, on piston. Compress spring and piston, aligning spring and piston with bore.

CAUTION: Make certain that piston pin is correctly aligned with hole in piston and that oil seal ring does not catch on lip of bore when installing piston.

3. Secure piston and spring with E-ring retainer and remove Installer, J-21885.
4. Install 1-2 accumulator primary spring and 1-2 accumulator primary valve into lower left bore.
5. Install 1-2 accumulator bushing into bore.
6. Install 1-2 accumulator secondary valve, stem end out, into the 1-2 accumulator bushing.
7. Install 1-2 accumulator secondary spring over stem end of valve.
8. Install 1-2 accumulator bore plug into the 1-2 accumulator bushing.
9. Place control valve body on cored side, compress plug and install grooved retaining pin from cast surface side of valve body, with grooved end of pin entering hole last.
10. Tap retaining pin with hammer until pin is flush with cast surface, and return control valve assembly to its original position.
11. Insert spacer inside of detent regulator valve spring and install spring and spacer into upper left bore, making certain spring seats in bottom of bore.
12. Compress detent regulator valve spring and hold with a small screwdriver placed between end of spring and wall on cored side of valve body.
13. Install detent regulator valve, stem end out, and detent valve, small land first, into upper left bore.
14. Insert bore plug, hole out, into upper left bore and, pressing inward on bore plug, remove screwdriver and install retaining pin from cored side of valve body.
15. Install 3-2 valve in bottom right bore.
16. Insert spacer inside of 3-2 valve spring and install spring and spacer in bottom right bore.
17. Compressing 3-2 valve spring, install bore plug, hole end out, and secure with retaining pin from cored side of valve body.

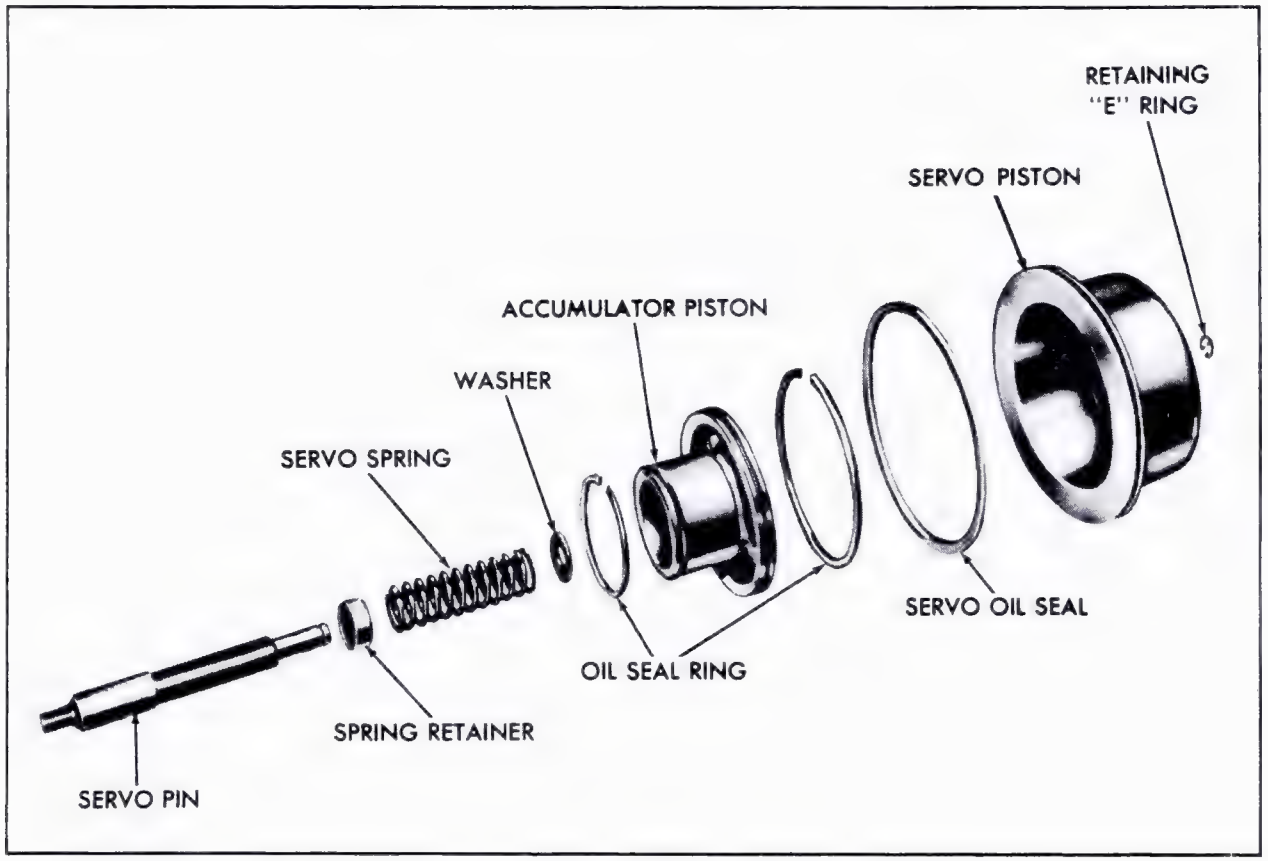


Fig. 7-67 Rear Servo and Accumulator Assembly Disassembled

18. Install 3-2 intermediate spring on stem end of 2-3 shift valve, and install valve and spring, valve first, into center right bore. Make certain valve seats in bottom of bore.

19. Install 2-3 modulator valve, hole end first, into 2-3 modulator bushing and install both parts in center right bore.

20. Install 2-3 shift valve spring into hole in 2-3 modulator valve, and compressing spring, secure with retaining pin from cored side of control valve.

21. Install 1-2 shift valve, stem end out, in upper right bore, making certain valve seats in bottom of bore.

22. Install 1-2 regulator valve, larger stem first, spring and 1-2 detent valve, hole end first, into 1-2 modulator bushing, aligning spring in bore of 1-2 detent valve, and install in upper right bore of control valve body.

23. Compress bushing against spring and secure with retaining pin from cored side of control valve body.

24. Install governor oil feed screen assembly in governor oil feed hole in control valve assembly, Fig. 7-66.

NOTE: Screen is held in place by governor feed pipe when installed on the transmission case.

25. Install manual valve with detent pin groove to the right.

i. Rear Servo Assembly (Fig. 7-67)

Disassembly

1. Remove rear accumulator piston from rear servo piston.
2. Remove E-ring retaining rear servo piston to band apply pin.
3. Remove rear servo piston and seal from band apply pin.
4. Remove washer, spring and retainer.

Inspection

1. Inspect fit of oil seal rings in accumulator piston. Clearance between side of ring and groove should be free with a maximum clearance of .003 inch.
2. Install accumulator oil seal ring in case bore and check fit of ring to bore.
3. Inspect fit of band apply pin in servo piston.
4. Inspect band apply pin for scores or cracks.
5. Inspect band apply pin for proper size as determined by pin selection check (Note 16g).

Assembly

1. Install spring retainer with cup side toward

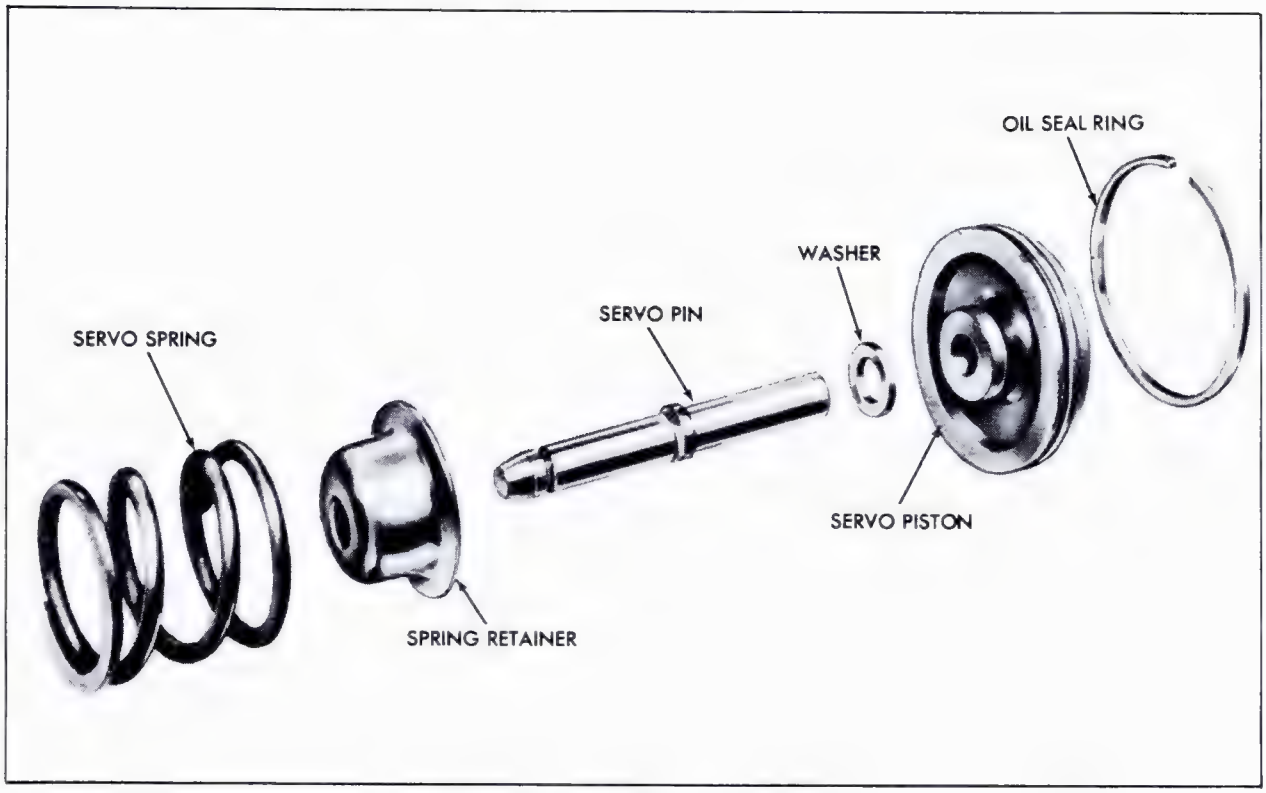


Fig. 7-68 Front Servo Disassembled

band apply servo pin, spring, and washer on servo pin.

2. Install servo piston on pin and secure with E-ring retainer.

3. If removed, install oil seal ring on servo piston.

4. If removed, install outer and inner oil rings on accumulator piston.

5. Install accumulator piston into bore of servo piston.

j. Front Servo Assembly (Fig. 7-68)

Inspection

1. Inspect servo pin for damage.

2. Inspect piston for damaged oil ring groove, check freedom of ring in groove.

3. Inspect piston for cracks or porosity.

4. Check fit of servo pin in piston.

Assembly

1. Reassemble parts of front servo, making sure tapered end of servo pin is pointing through the spring and spring retainer.

k. Oil Pump Assembly

NOTE: On service replacement pumps the cooler by-pass valve is not used.

Disassembly

1. Using Adapter, J-21364, in Rear Unit Holding Fixture, J-6116, place pump assembly in Holding Fixture with stator shaft pointing downward. Be careful not to damage shaft.

2. Compress regulator boost valve bushing against pressure regulator spring and remove snap ring using Snap Ring Pliers J-5403 (#21), Fig. 7-69.

CAUTION: Pressure regulator spring is under extreme pressure.

3. Remove regulator boost valve bushing and valve.

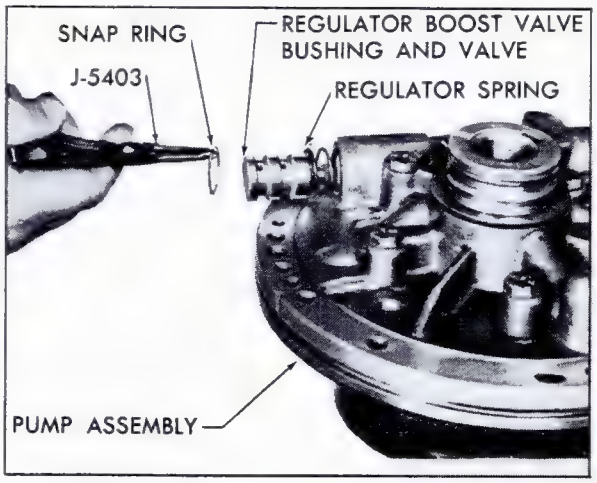


Fig. 7-69 Removing Pressure Regulator Valve Snap Ring

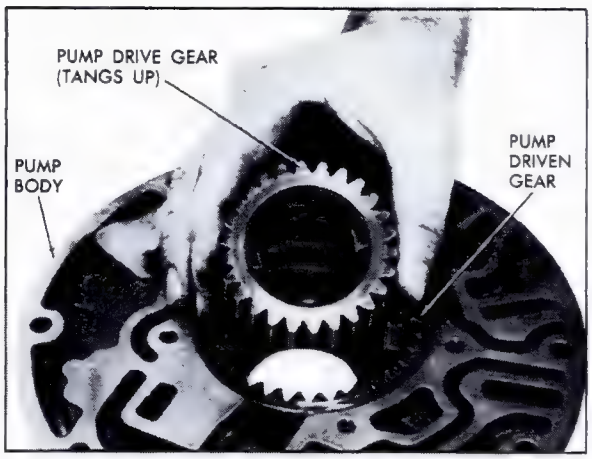


Fig. 7-70 Removing Pump Gears

4. Remove pressure regulator spring.
5. Remove regulator valve, spring retainer, and spacer or spacers if present.
6. Remove five pump cover attaching screws and remove pump cover from body.
7. Mark drive and driven gears for reassembly in same position and remove from pump body, Fig. 7-70.

NOTE: Installing the gears in the same position as removed will assure the quietest operation, as the gear teeth will mesh in the established wear pattern.

8. Remove retaining pin and bore plug from end of regulator bore.
9. Remove two oil rings from pump cover.
10. Remove pump to forward clutch housing selective washer (fiber).

NOTE: Do not remove cooler by-pass valve seat in next step unless replacement of the seat, valve, or spring is necessary.

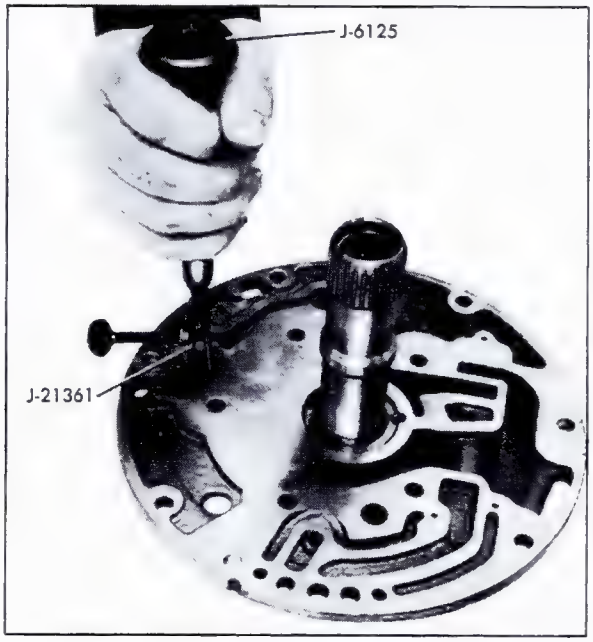


Fig. 7-71 Removing By-Pass Valve Seat

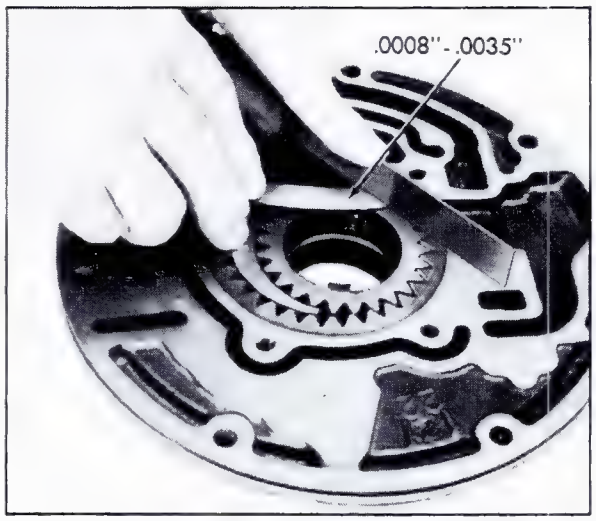


Fig. 7-72 Pump Body Face to Gear Face Clearance

The sealing qualities of the by-pass valve can be checked by pouring a small quantity of thinner or spirits into valve pocket and checking for excessive leakage.

11. If necessary, remove the cooler by-pass valve seat using Pump Check Valve Seat Remover, J-21361, attached to Slide Hammer, J-6125-1, and Adapter J-6125-2, Fig. 7-71. Install remover tool in valve seat and drive upward on slide hammer to remove valve seat.

NOTE: The seat may also be removed by threading the seat with a 3/8-16 tap and using Adapter J-6125-2 on Slide Hammer, J-6125-1, to drive seat out. If this method is used, flush all foreign material and machining chips out of the by-pass valve bore before installing new seat.

12. Remove by-pass valve and spring.
13. If necessary to replace front oil seal, pry seal from pump body, Fig. 7-40.

Inspection of Pump Body

1. Inspect gear pockets and crescent for scoring, galling or other damage.
2. Place pump gears in pump body and check pump body face to gear face clearance. Clearance should be .0008 inch - .0035 inch, Fig. 7-72.
3. Check face of pump body for scores or nicks.
4. Check oil passages for proper opening and lack of porosity.
5. Check for damaged cover bolt attaching threads.
6. Check for overall flatness of pump body face.
7. Check bushing for scores or nicks.

Inspection of Pump Cover (Fig. 7-73)

1. Inspect pump cover face for overall flatness.

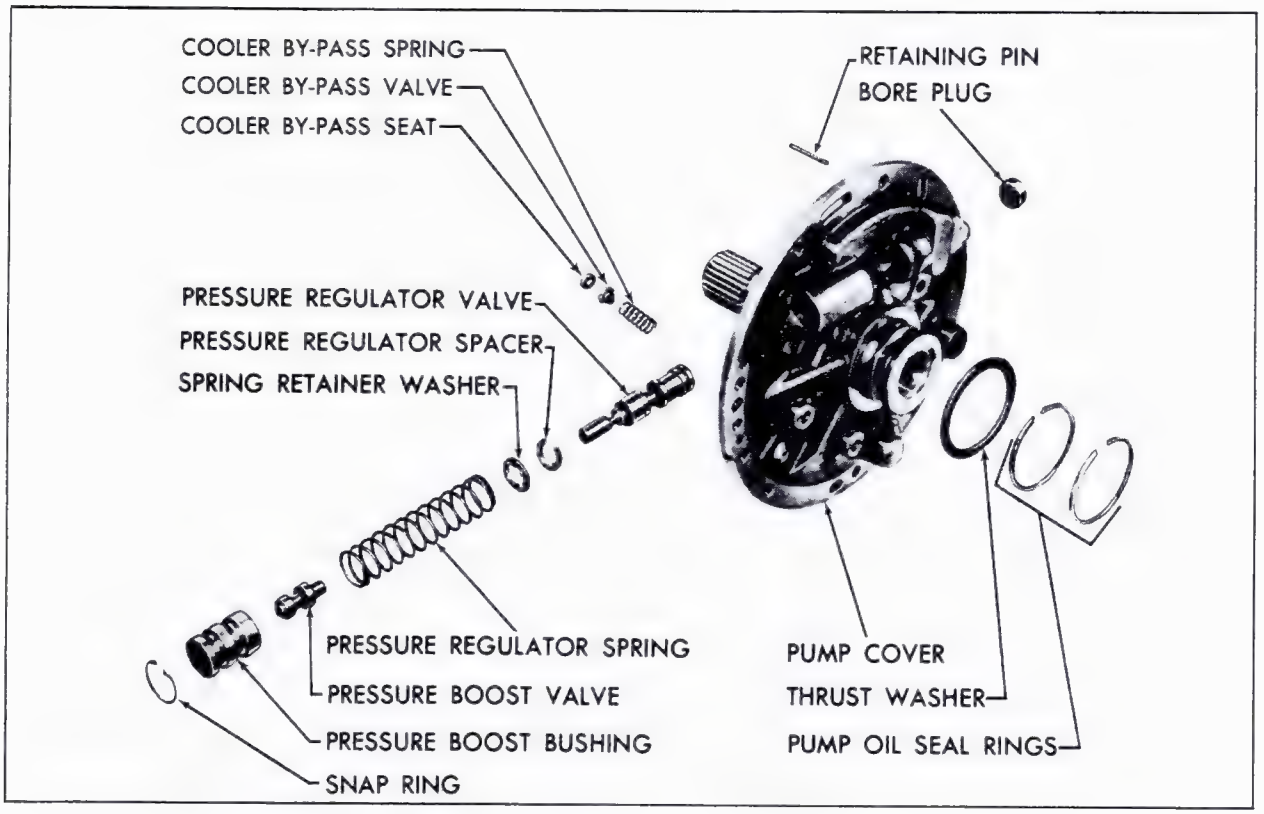


Fig. 7-73 Pump Cover Disassembled

2. Check for scores or dirt in pressure regulator bore.
3. Make certain all passages are open and not interconnected through porosity.
4. Check for scoring or damage at pump gear face.
5. Inspect stator shaft for damaged splines, or scored bushings.
6. Inspect oil ring grooves for damage or wear.
7. Inspect cooler by-pass valve for free operation and sealing qualities.
8. Inspect selective washer thrust face for wear or damage.
9. Install pump cover oil rings into counterbore of forward clutch housing and check for proper fit.
10. Inspect pressure regulator and boost valve for free operation.
11. Inspect pump cover for open 1/8 inch diameter breather hole.

Assembly

1. Install drive and driven pump gears into pump body with alignment marks up and mated. In this position the pump gear drive tangs will also be up.
2. Install pressure regulator spacer or spacers, if required, spring retainer, and spring into pressure regulator bore.
3. Install boost valve into bushing, stem end out, and install both parts into pump cover by compressing bushing against spring.
4. Install retaining snap ring.
5. Install pressure regulator valve from opposite end of bore, stem end first.
6. Install pressure regulator valve bore plug and retaining pin into end of bore.
7. Install previously selected front unit selective thrust washer (fiber) over pump cover delivery sleeve.

NOTE: Proper washer size was determined at time of front unit end play check (Note 16j).

8. Install two hook type oil seal rings.

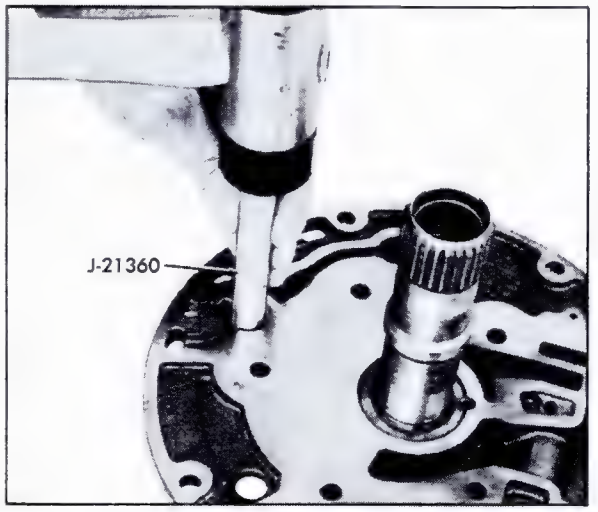


Fig. 7-74 Installing By-Pass Valve Seat

9. If previously removed, install cooler bypass valve spring (large end first), valve, and valve seat. Use Pump Check Valve Seat Installer, J-21360, Fig. 7-74, to install valve seat.

10. Place pump body in Rear Unit Holding Fixture, J-6116, with cored passages facing up.

11. Lubricate pump gears with transmission fluid and install pump cover on pump body.

12. Install pump cover attaching screws following screw chart, Fig. 7-75. Leave screws one turn loose at this time.

13. Install pump Body and Cover Alignment Band, J-21368, around pump assembly. Tighten wing nut on alignment band to align pump cover with pump body, Fig. 7-76.

14. Tighten pump cover attaching screws to 18 foot-pounds and remove alignment band from pump.

15. Install new square cut O-ring on pump.

16. If necessary, install new pump oil seal using pump Oil Seal Installer, J-21359, Fig. 7-41.

I. Forward Clutch Assembly—Disassembly

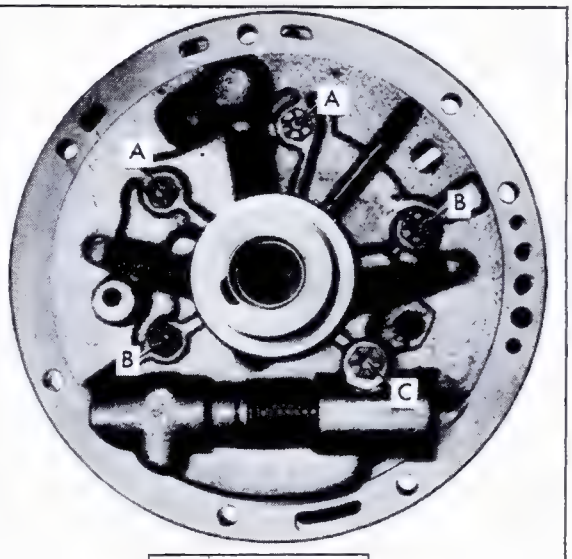
1. Using Adapter, J-21364, in Rear Unit Holding Fixture, J-6116, place forward clutch assembly in Holding Fixture with turbine shaft pointing downward. Be careful not to damage shaft.

2. Remove forward clutch housing to direct clutch hub snap ring.

3. Remove direct clutch hub.

4. Remove forward clutch hub and one thrust washer from each side of hub, Fig. 7-77.

5. Remove five radially grooved composition and five steel clutch plates.



BOLT	SIZE
A -	5/16 - 18 x 1
B -	5/16 - 18 x 1½
C -	5/16 - 18 x 1¾

Fig. 7-75 Pump Cover Attaching Screw Chart

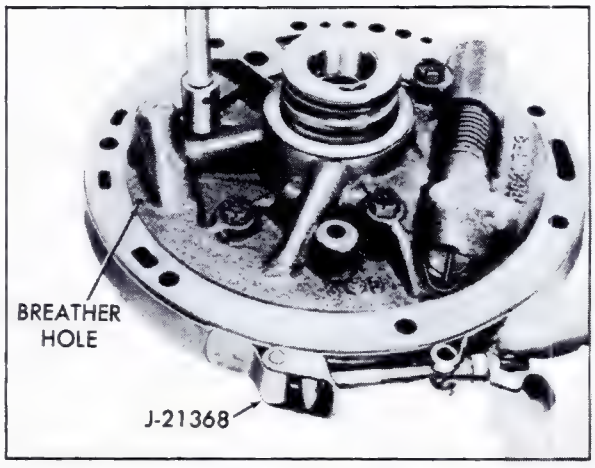


Fig. 7-76 Aligning Pump Cover with Pump Body

6. Place forward clutch assembly in arbor press with turbine shaft pointing downward.

7. Using Clutch Spring Compressor, J-4670, and Adapter, J-21664, compress spring retainer with arbor press and remove snap ring using Snap Ring Pliers, J-8059 or J-5586, Fig. 7-78.

8. Remove tools, spring retainer and 16 clutch release springs.

9. Remove forward clutch piston from forward clutch housing.

10. Remove inner and outer seals from clutch piston.

11. Remove center piston seal from forward clutch housing.

12. It is not necessary to remove turbine shaft from forward clutch housing unless either shaft or housing is damaged and must be replaced. In such case proceed as follows:

a. Place forward clutch housing in arbor press with turbine shaft pointing downward.

b. Using 3/8 inch drive extension approximately 3 inches long, or similar tool as driver, press turbine shaft out of forward clutch housing.

Inspection

1. Inspect composition faced and steel clutch plates for signs of burning, scoring or wear.

2. Inspect sixteen release springs for collapsed coils or signs of distortion.

3. Inspect clutch hubs for worn splines, proper lubrication holes, and thrust faces.

4. Inspect piston for cracks.

5. Inspect clutch housing for wear, scoring, cracks and open oil passages.

6. Inspect operation of ball check in forward clutch housing.

7. Inspect turbine shaft for open lubrication passages at each end.

8. Inspect turbine shaft splines for damage.

9. Inspect bushing journals for damage.

10. Inspect turbine shaft for cracks or distortion.

Assembly

1. If turbine shaft was previously removed

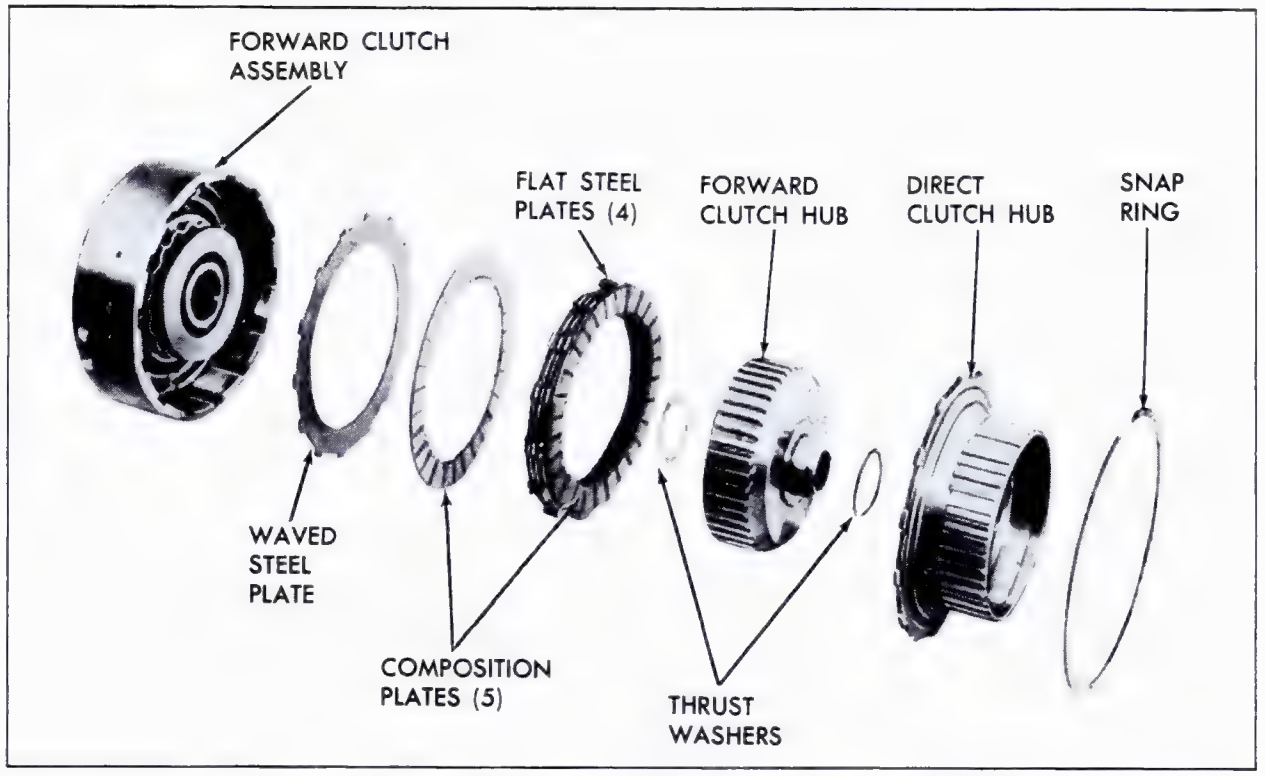


Fig. 7-77 Forward Clutch and Forward and Direct Clutch Hubs Disassembled

from forward clutch housing proceed as follows:

a. Place forward clutch housing on arbor press with flat side up.

b. Align shorter splined end of turbine shaft with splines in forward clutch housing, and using arbor press, carefully press shaft into housing until shaft bottoms on hub of housing.

CAUTION: Start shaft into housing and back off on arbor press to allow shaft to straighten itself. Repeat this step several times until you are certain shaft is going in straight, otherwise, shaft or housing splines may be damaged.

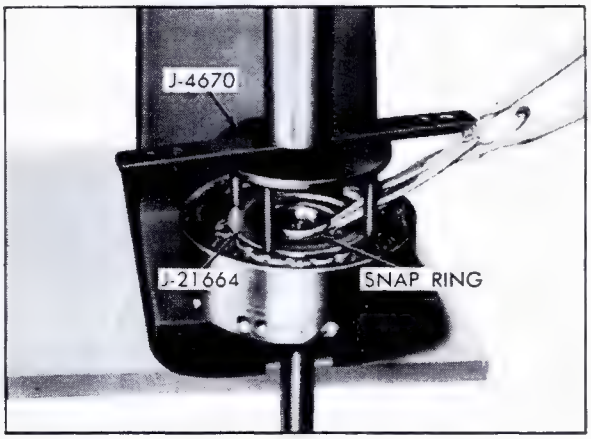


Fig. 7-78 Removing and Installing Forward Clutch Housing Snap Ring

2. Invert forward clutch housing on arbor press with turbine shaft pointing downward.

3. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in forward clutch piston with petrolatum and install seals with lips facing away from spring pockets.

NOTE: The forward and direct clutch pistons have identical inside and outside diameters. Therefore, extreme care should be exercised during reassembly to assure the proper piston be installed in the clutch assemblies.

The forward clutch piston can be identified by the absence of a check ball in the clutch apply face of the piston.

4. Lubricate new center piston seal with transmission fluid. Lubricate seal groove in forward clutch housing with petrolatum and install seal into clutch housing with lip facing up.

5. Place Forward and Direct Clutch Inner Seal Protector, J-21362, over forward clutch hub. Install clutch piston inside Forward and Direct Clutch Piston Installer, J-21409, insert assembly in forward clutch housing, Fig. 7-79, and install clutch piston by rotating it slightly in a clockwise direction until seated.

6. Install sixteen clutch release springs into spring pockets in clutch piston.

NOTE: Forward clutch release springs are dyed green and are not interchangeable with the red colored springs used in the direct clutch piston.

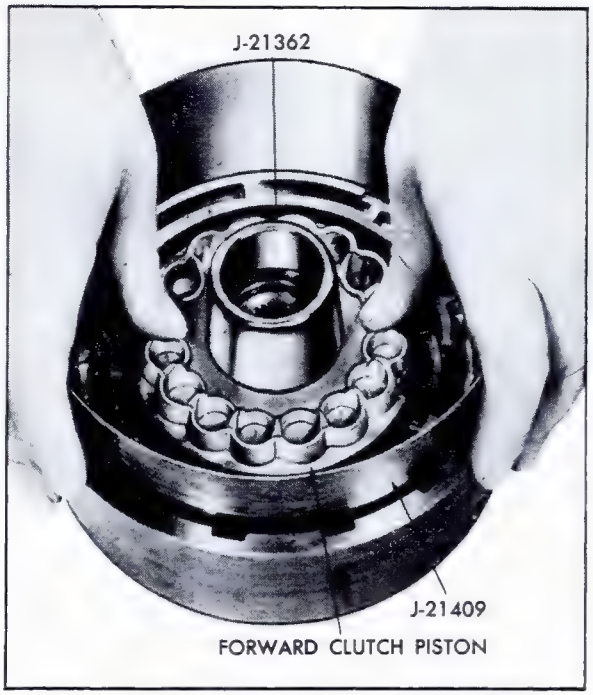


Fig. 7-79 Installing Forward Clutch Piston

7. Using Clutch Spring Compressor, J-4670, and Adapter, J-21664, compress spring retainer with arbor press, being careful that retainer does not catch in snap ring groove, and install snap ring using Snap Ring Pliers, J-8059 or J-5586, Fig. 7-78. Remove tools.

CAUTION: Make certain clutch release springs are not leaning. If necessary, straighten with a small screwdriver.

8. Remove forward clutch assembly from arbor press and place in Holding Fixture, J-6116, with turbine shaft pointing down. Be careful not to damage shaft.

9. Install phenolic thrust washer on the outside of forward clutch hub. The bronze washer is installed on side of hub facing forward clutch housing.

10. Install forward clutch hub in forward clutch housing.

11. Lubricate the four flat steel, five radially grooved composition and one waved U-notched steel clutch plates with transmission fluid and install clutch plates in forward clutch housing, Fig. 7-77. Start with waved steel plate and alternate composition and steel plates.

NOTE: Radially grooved composition plates are installed at the factory only. All service composition plates have the smooth surface configuration.

12. Install direct clutch hub in forward clutch housing over clutch plates, and install snap ring.

13. Place forward clutch housing on pump delivery sleeve and air check clutch operation by applying air through forward clutch passage in pump, Fig. 7-80, to actuate piston and move forward clutch.

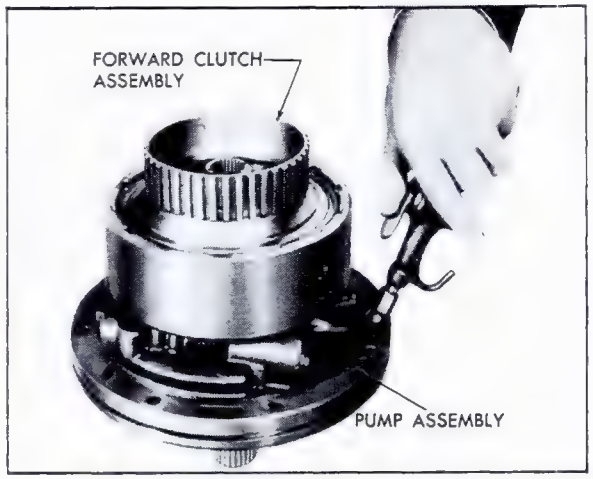


Fig. 7-80 Air Checking Forward Clutch

m. Direct Clutch and Intermediate Sprag Assembly (Fig. 7-81)

Disassembly

1. Remove sprag retainer snap ring, and remove clutch retainer.
2. Remove sprag, outer race, and bushings, and remove sprag assembly from outer race.
3. Turn unit over and remove direct clutch backing plate to clutch housing snap ring.
4. Remove direct clutch backing plate and six composition and six steel clutch plates, Fig. 7-82.
5. Using Clutch Spring Compressor, J-4670, Rear Clutch Spring Compressor, J-6129, or an arbor press, and Adapter, J-21664, Fig. 7-83, compress spring retainer and remove snap ring with Snap Ring Pliers, J-8059 or J-5586.
6. Remove tools, spring retainer, and sixteen clutch release springs.
7. Remove direct clutch piston from direct clutch housing.
8. Remove inner and outer seals from clutch piston.
9. Remove center piston seal from direct clutch housing.

Inspection

1. Inspect sprag assembly for popped or loose sprags.
2. Inspect sprag bushing for wear or distortion.
3. Inspect inner and outer races for scratches or wear.
4. Inspect clutch housing for cracks, wear, proper opening of oil passages and wear on clutch plate drive lugs.
5. Inspect composition-faced and steel clutch plates for signs of wear or burning.
6. Inspect backing plate for scratches or other damage.

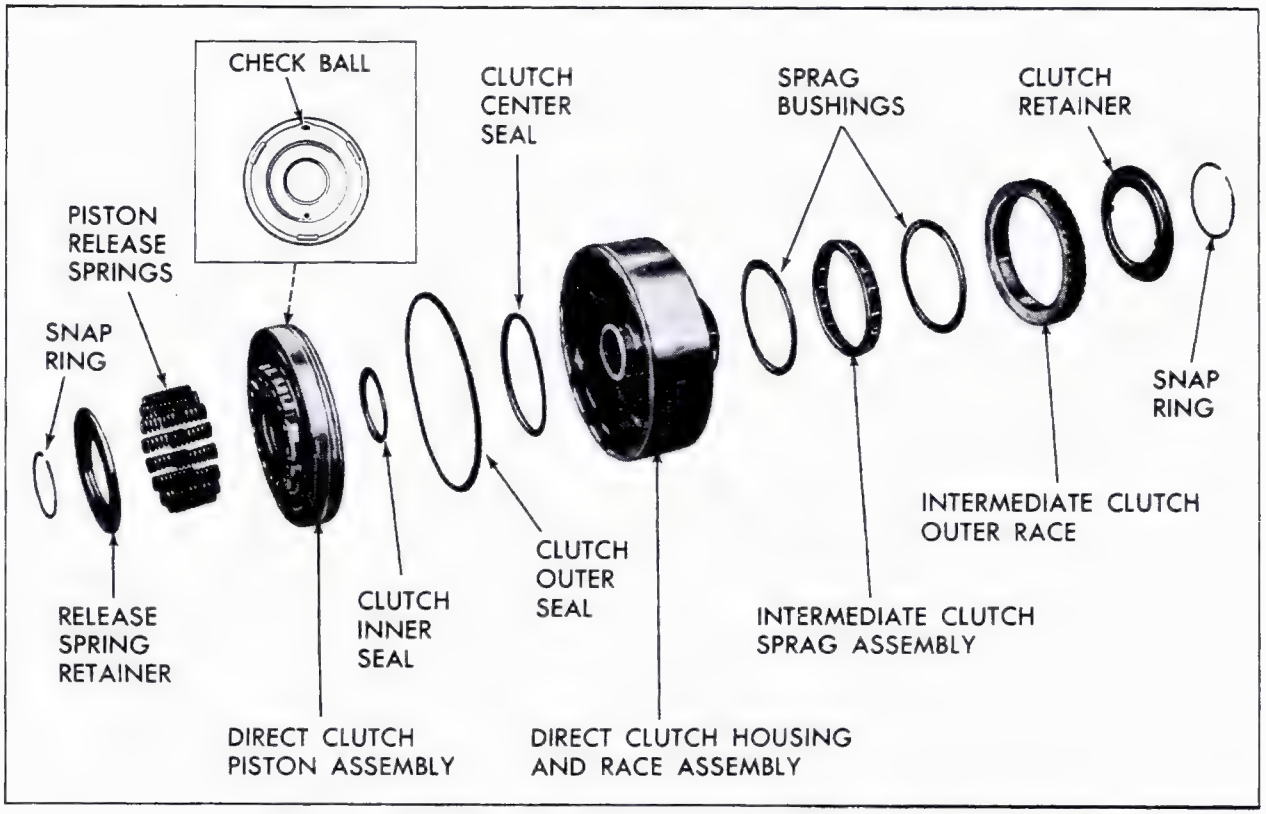


Fig. 7-81 Direct Clutch and Piston Disassembled

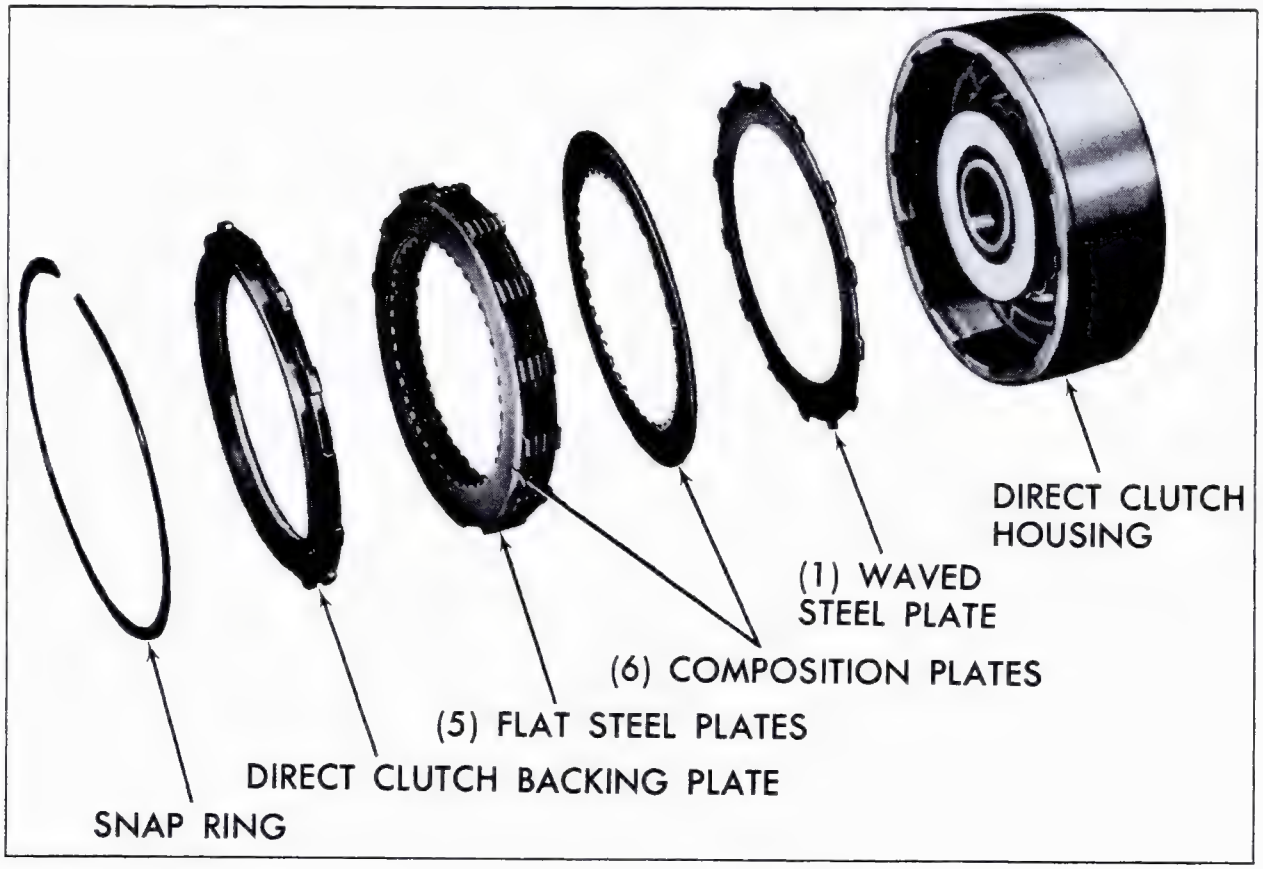


Fig. 7-82 Direct Clutch Disassembled

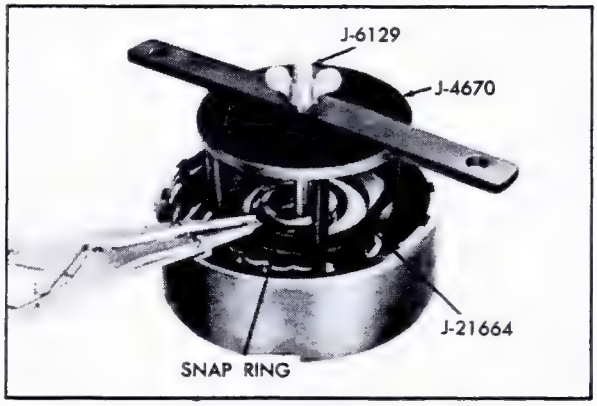


Fig. 7-83 Removing and Installing Direct Clutch Housing Snap Ring

7. Inspect piston for cracks and free operation of ball check.
8. Inspect springs for collapsed coils or signs of distortion.

Assembly

1. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in direct clutch piston and install seals with lips facing away from spring pockets.

NOTE: Make certain piston has ball check.

2. Lubricate new center seal with transmission fluid. Lubricate seal groove in direct clutch housing and install seal in clutch housing with lip facing up.
3. Place Forward and Direct Clutch Inner Seal Protector, J-21362, over direct clutch hub. Install clutch piston inside Forward and Direct Clutch Piston Installer, J-21409, insert assembly in direct clutch housing, Fig. 7-84, and install clutch piston by rotating it slightly, in a clockwise direction.
4. Install 16 clutch release springs into spring pockets in clutch piston.

NOTE: Direct clutch release springs are red in color and are not interchangeable with the green colored springs used in the forward clutch piston.

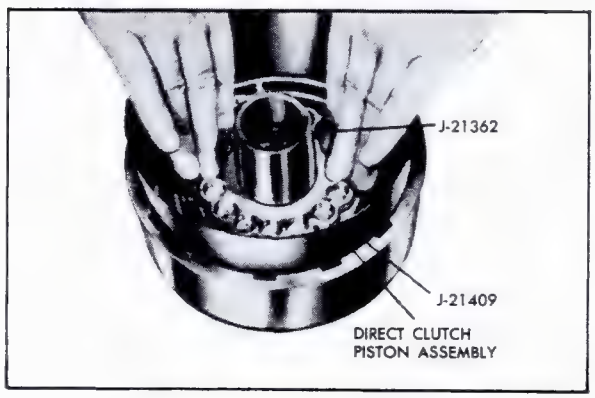


Fig. 7-84 Installing Direct Clutch Piston

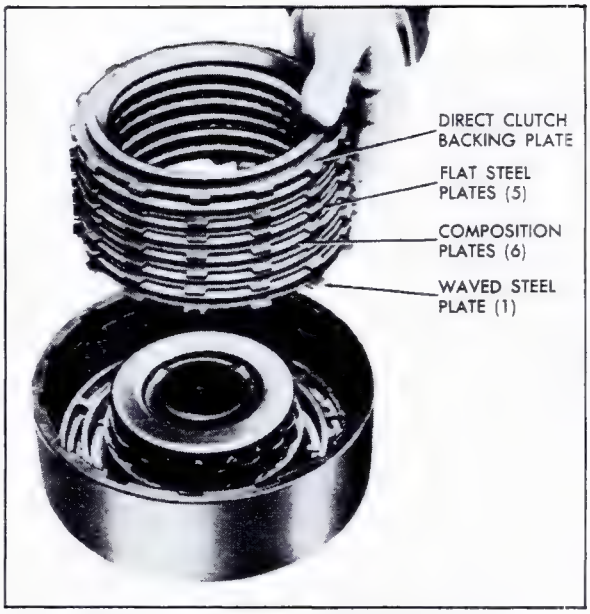


Fig. 7-85 Installing Direct Clutch Plates

5. Place spring retainer and snap ring over springs.
6. Using Clutch Spring Compressor, J-4670, Rear Clutch Spring Compressor, J-6129, or an arbor press, and Adapter, J-21664, Fig. 7-83, compress spring retainer, being careful that retainer does not get caught in snap ring groove, and install snap ring with Snap Ring Pliers, J-8059 or J-5586. Remove tools.

NOTE: Make certain clutch release springs are not leaning. If necessary, straighten springs with a small screwdriver.

7. Lubricate the five flat and one waved, U-notched steel and six composition clutch plates with transmission fluid and install clutch plates in direct clutch housing Fig. 7-85. Start with waved steel plate and alternate composition and steel plates.

NOTE: Do not use radially grooved composition plates here.

8. Install direct clutch backing plate over clutch plates and install backing plate snap ring.
9. Invert clutch housing and install one sprag bushing, cup side up, around sprag inner race.
10. Install sprag assembly into clutch outer race.
11. With ridge on inner cage of sprag facing down, install sprag and outer race on inner race with clockwise turning motion.

NOTE: When installed, outer race should not turn counterclockwise, Fig. 7-86.

12. Install sprag bushing, cup side down, over sprag assembly.

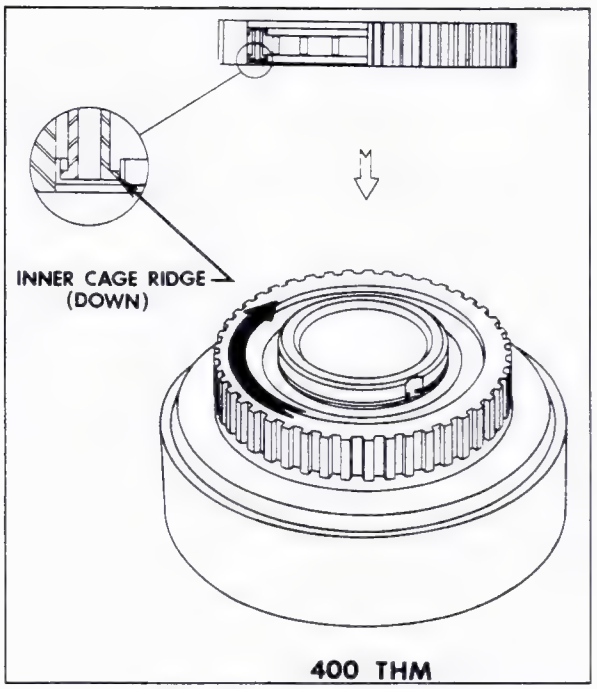


Fig. 7-86 Sprag Rotation

13. Install sprag retainer and snap ring.
14. Place direct clutch assembly on center support and air check operation of direct clutch, Fig. 7-87.

NOTE: If air is applied through reverse passage, (right oil feed hole) it will escape from direct clutch passage (left oil feed hole). This is considered normal. Apply air through left oil feed hole to actuate piston and move direct clutch.

n. Center Support and Intermediate Clutch Piston

Disassembly (Fig. 7-88)

1. Remove four oil seal rings from center support.
2. Using Clutch Spring Compressor, J-4670, and Rear Clutch Spring Compressor, J-6129, Fig. 7-89, compress spring retainer and remove snap ring with Snap Ring Pliers, J-8059 or J-5586.
3. Remove tools, spring retainer, and 12 intermediate clutch release springs.
4. Remove intermediate clutch piston from center support.
5. Remove inner and outer seals from clutch piston.

NOTE: Do not remove the three screws retaining roller clutch inner race to center support.

Inspection

1. Inspect roller clutch inner race for scratches or indentations. Be sure lubrication hole is open.
2. Inspect bushing for scoring, wear or galling.
3. Check oil ring grooves for damage.
4. Air check oil passages to be sure they are open and not interconnected.
5. Inspect piston sealing surfaces for scratches.
6. Inspect piston seal grooves for nicks or other damages.
7. Inspect piston for cracks or porosity.
8. Inspect springs for collapsed coils or signs of distortion.

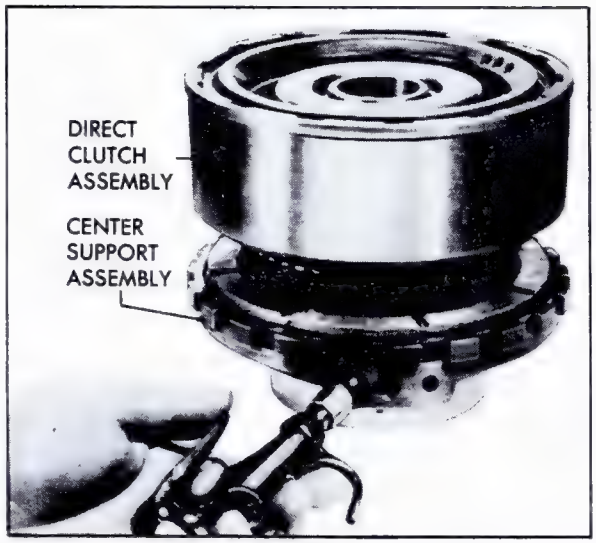


Fig. 7-87 Air Checking Direct Clutch

Assembly

1. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in intermediate clutch piston and install seals with lips facing away from spring pockets.
2. Place Intermediate Clutch Inner Seal Protector, J-21363, over center support hub, Fig. 7-90, and install intermediate clutch piston, making certain it fully seats in center support. Remove J-21363.
3. Install 12 clutch release springs into spring pockets in clutch piston.
4. Place spring retainer and snap ring over springs.
5. Position snap ring and using Clutch Spring Compressor, J-4670, and Rear Clutch Spring Compressor, J-6129, Fig. 7-89, compress spring retainer, being careful that retainer does not get caught in snap ring groove, and install snap ring with Snap Ring Pliers, J-8059 or J-5586. Remove tools.
6. Install four oil seal rings on center support. Blue oil seal ring is nearest piston.
7. Air check operation of intermediate clutch piston. Apply air through center oil feed hole to actuate clutch pistons, Fig. 7-91.

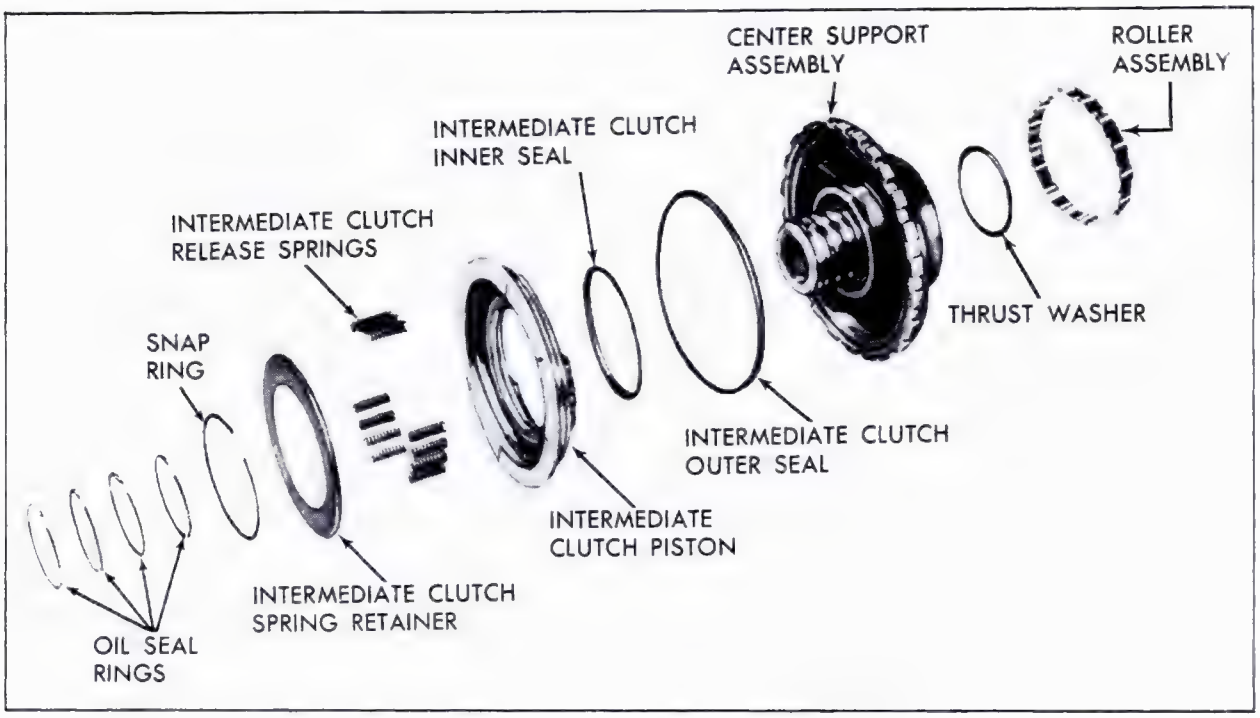


Fig. 7-88 Center Support Assembly Disassembled

o. Gear Unit (Fig. 7-92)

Disassembly of Gear Unit

1. Using Adapter, J-21364, in Rear Unit Holding Fixture, J-6116, place gear unit in Holding Fixture with output shaft pointing downward.

2. Remove center support to sun gear races and thrust bearing.

NOTE: Outer race may have stuck to center support when it was removed.

3. Remove sun gear from output carrier assembly.

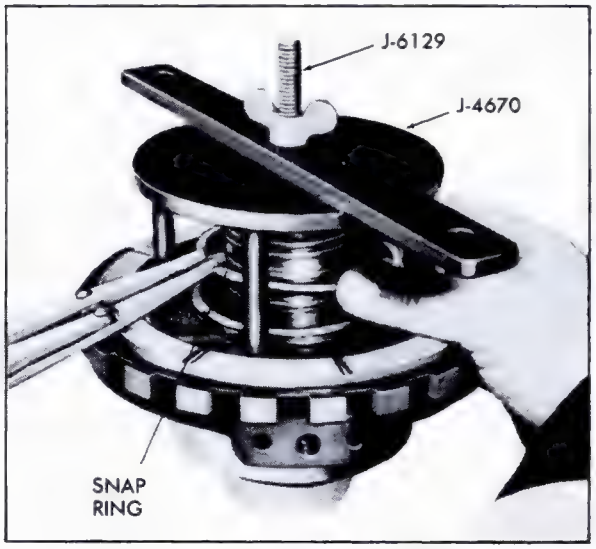


Fig. 7-89 Removing and Installing Intermediate Clutch Piston Snap Ring

4. Remove reaction carrier to output carrier thrust washer and front internal gear ring.

5. Invert gear unit in Holding Fixture with main shaft pointing downward.

6. Remove snap ring securing output shaft to output carrier and remove output shaft. Remove O-ring (AA transmissions only) from output shaft and discard.

7. Remove thrust bearing and races from rear internal gear.

8. Lift rear internal gear and main shaft out of output carrier and remove thrust bearing and races from inner face of rear internal gear.

9. Remove snap ring from end of main shaft and remove rear internal gear.

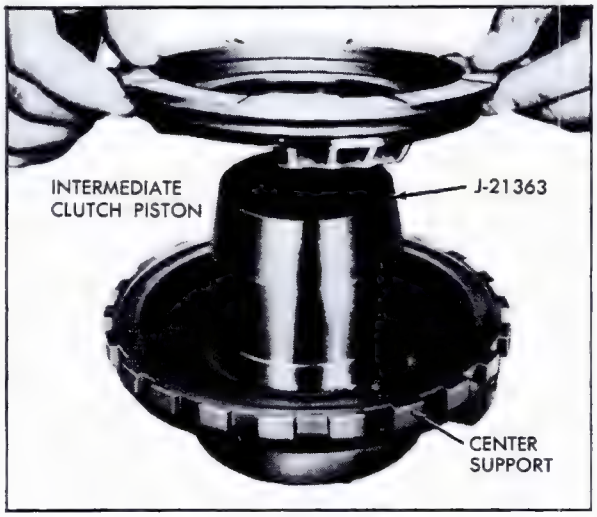


Fig. 7-90 Installing Intermediate Clutch Piston

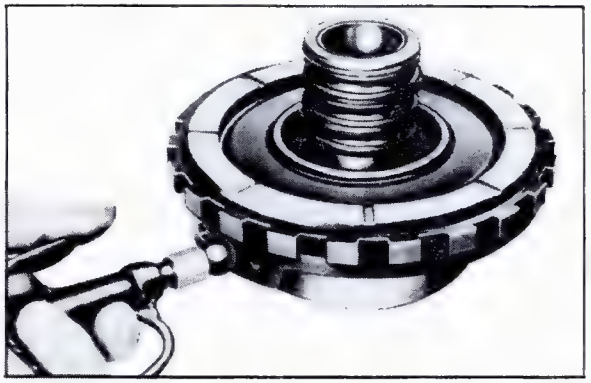


Fig. 7-91 Air Checking Intermediate Clutch

10. Remove output carrier from Holding Fixture.

Inspection of Output Shaft

1. Inspect case bushing for wear or galling.
2. Inspect bearing and thrust washer surfaces for damage.
3. Inspect governor drive gear for rough or damaged teeth.
4. Inspect splines for damage.
5. Inspect orificed cup plug in the lubrication passage.
6. Inspect drive lugs for damage.
7. Inspect speedometer drive gear for rough or damaged teeth. If replacement of drive gear is necessary, proceed as follows:

Speedometer Drive Gear Removal and Installation

NOTE: The steel speedometer drive gear is used at the beginning of the model year. The nylon gear is scheduled to be released later in production. The nylon speedometer drive gear is installed at the factory only. All service replacement drive gears are steel. If the occasion should arise when the nylon gear is removed for inspection of the shaft or gear only, it may be re-installed using steps 1 and 2 immediately below. In all other cases, see Speedometer Drive Gear Replacement.

1. Depress retaining clip and slide gear off output shaft, Fig. 7-93.
2. Place retaining clip (square end toward flange of shaft) into hole in output shaft, Fig. 7-93. Align slot in speedometer drive gear with retaining clip and install gear so that cutouts or one of the flat sides of the gear are installed first.

Speedometer Drive Gear Replacement

1. If nylon gear is on shaft, depress retaining

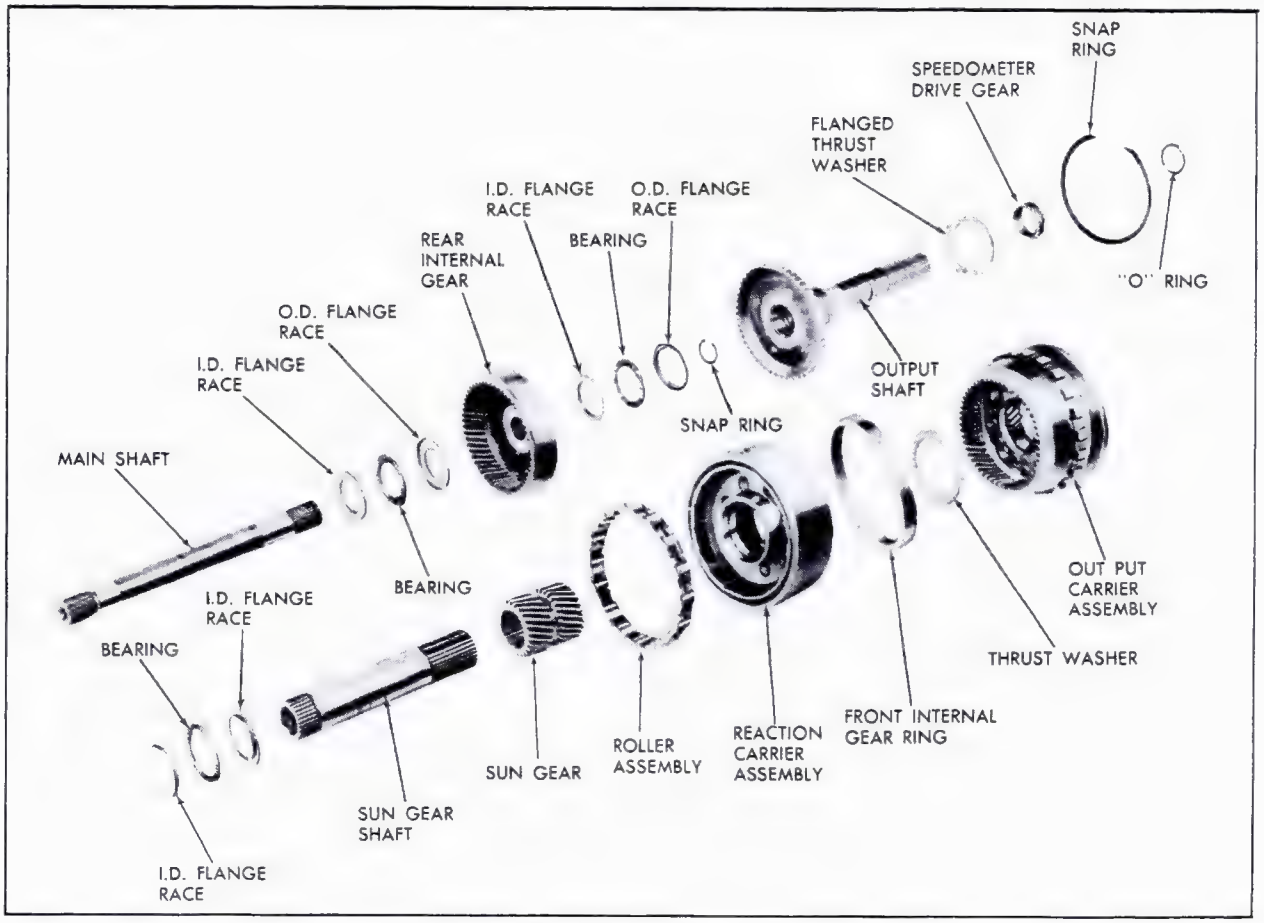


Fig. 7-92 Gear Unit Assembly Disassembled

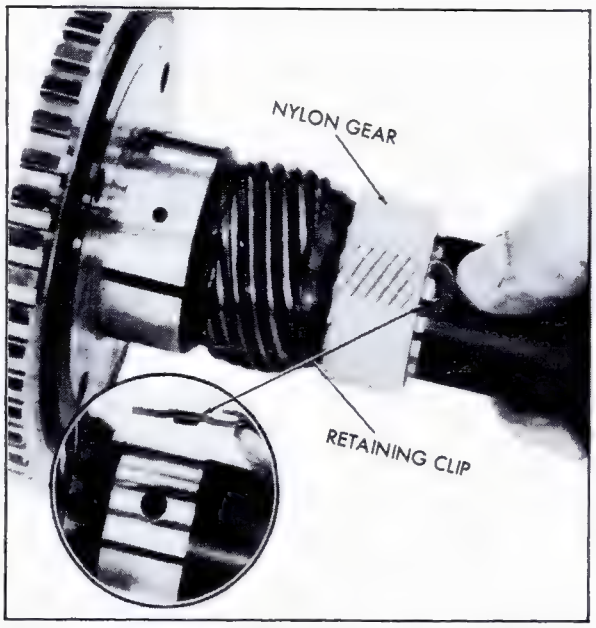


Fig. 7-93 Removing and Installing Nylon Speedometer Drive Gear

clip and slide gear off output shaft, Fig. 7-93. Discard retaining clip.

2. If steel gear is on shaft:

a. Install Speedometer Drive Gear Remover, J-21427, with Pulley Puller, J-8433, and attach, using Speedometer Drive Gear Remover Bolts, J-21797, on output shaft so that puller bolt indexes with end of shaft and flat face of remover tool is under front face of drive gear.

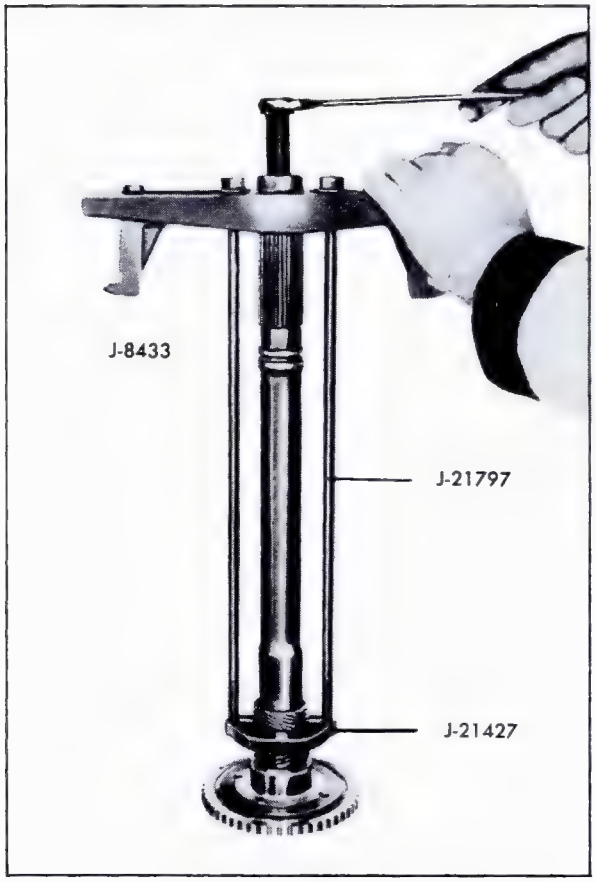


Fig. 7-94 Removing Steel Speedometer Drive Gear

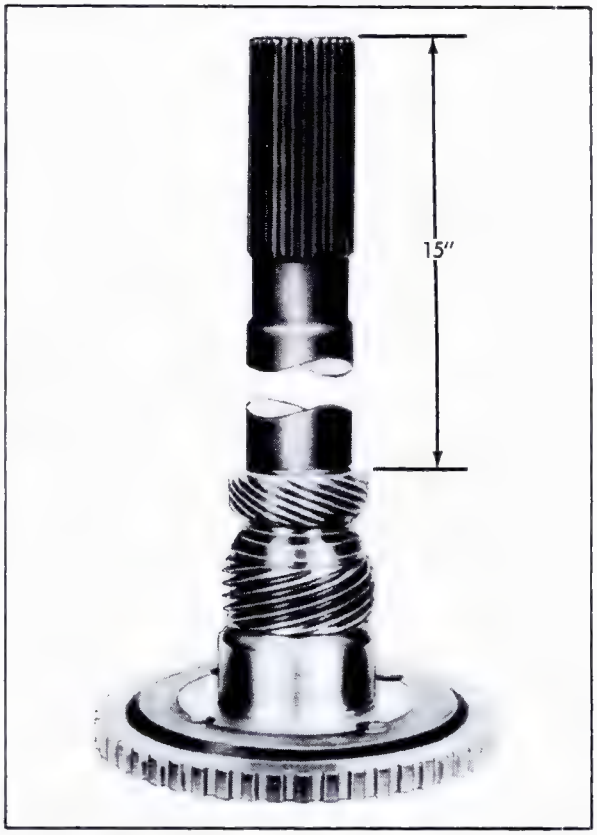


Fig. 7-95 Steel Speedometer Drive Gear Installed

b. Tighten bolt on Pulley Puller, Fig. 7-94, until gear is free on shaft. Remove tools and gear from shaft.

3. Support output shaft and install new steel speedometer drive gear using a piece of pipe.

CAUTION: Use a pipe that closely fits output shaft and does not contact gear teeth. Contact with gear teeth would result in damage to the gear as it is driven into place.

4. Drive gear onto shaft until distance from rear face of gear to end of output shaft is 15 inches, Fig. 7-95.

Inspection of Main Shaft

1. Inspect shaft for cracks or distortion.
2. Inspect splines for damage.
3. Inspect ground bushing journals for damage.
4. Inspect snap ring groove for damage.
5. Inspect orificed cup plug in end of main shaft. Be sure it is not plugged.

Inspection of Rear Internal Gear

1. Inspect gear teeth and bearing surfaces for damage or wear.
2. Inspect splines for damage.
3. Inspect gear for cracks.

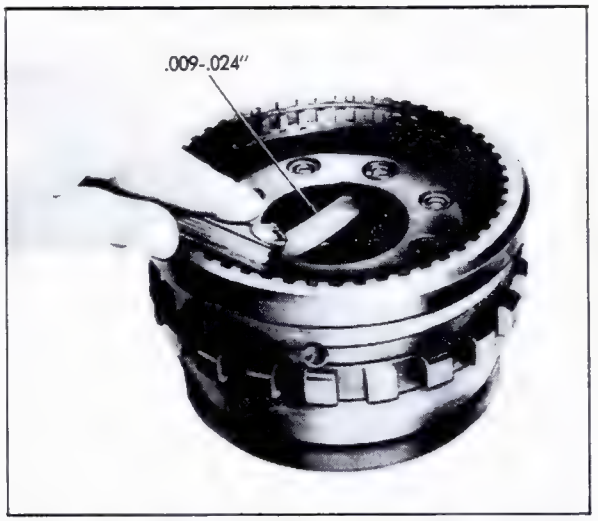


Fig. 7-96 Checking Output Carrier Pinion End Play

Inspection of Output Carrier Assembly

1. Inspect front internal gear for damaged teeth.
2. Inspect pinion gears for damage, rough bearings or excessive tilt.
3. Check pinion end play. Pinion end play should be .009 inch-.024 inch, Fig. 7-96.
4. Inspect parking gear lugs for cracks or damage.
5. Inspect output shaft locating splines for damage.
6. Inspect front internal gear ring for flaking or cracks.

Inspection of Reaction Carrier Assembly

1. Inspect band surface on reaction carrier for signs of burning or scoring.
2. Inspect roller clutch outer cam for scoring or wear.
3. Inspect thrust washer surfaces for signs of scoring or wear.
4. Inspect bushing for damage. If bushing is damaged, carrier must be replaced.
5. Inspect pinion gears for damage, rough bearings or excessive tilt.
6. Check pinion end play. Pinion end play should be .009 inch - .024 inch.

Pinion Gear Replacement—Reaction and Output Carrier Assemblies

1. Support carrier assembly on its FRONT face.
2. Using a 1/2 inch diameter drill, remove stake marks from the end of the pinion pin, or pins, to be replaced. This will reduce the possibility of cracking the carrier when pinion pins are pressed out.

CAUTION: Do not allow drill to remove any stock from the carrier as this will weaken the part and could cause failure.

3. Using a tapered punch, drive or press pinion pins out of carrier.
4. Remove pinion gears, thrust washers, and roller needle bearings.
5. Inspect pinion pocket thrust faces for burrs and remove if present.
6. Install eighteen needle bearings into each pinion gear using petrolatum to hold bearings in place. Use a pinion pin as a guide.
7. Place a bronze and steel thrust washer on each side of pinion gear with steel washers against gear, Fig. 7-97. Hold washers in place with petrolatum.
8. Place pinion gear assembly in position in carrier and install a pilot shaft through rear face of assembly to hold parts in place.
9. Drive a new pinion pin into place from the front, while rotating pinion gear. Be sure that headed end is flush or below face of carrier.
10. Using a punch in bench vise for an anvil, stake opposite end of pinion pin in three places with a blunt radius chisel, Fig. 7-98.

NOTE: Both ends of pinion pins must lie below face of carrier or interference may occur.

11. Repeat installation procedure for each pinion gear.

Inspection of Roller Clutch Assembly

1. Inspect roller clutch for damaged rollers or springs.
2. Inspect roller clutch cage for damage.

Inspection of Sun Gear

1. Inspect gear teeth for damage or wear.
2. Inspect splines for damage.
3. Be sure oil lubrication hole is open.

Inspection of Sun Gear Shaft

1. Inspect shaft for cracks or splits.
2. Inspect splines for damage.
3. Inspect bushings for scoring or galling.
4. Inspect ground bushing journals for damage.
5. Be sure oil lubrication hole is open.

Assembly of Complete Gear Unit

1. Install rear internal gear on end of mainshaft that has snap ring groove and install snap ring.
2. Install races and thrust bearing on inner face of rear internal gear, retaining races and bearing with petrolatum. Proceed as follows:
   a. Install large diameter race first, with flange facing up, Fig. 7-99.
   b. Install thrust bearing in race.
   c. Install small diameter race on bearing with inner flange facing down.

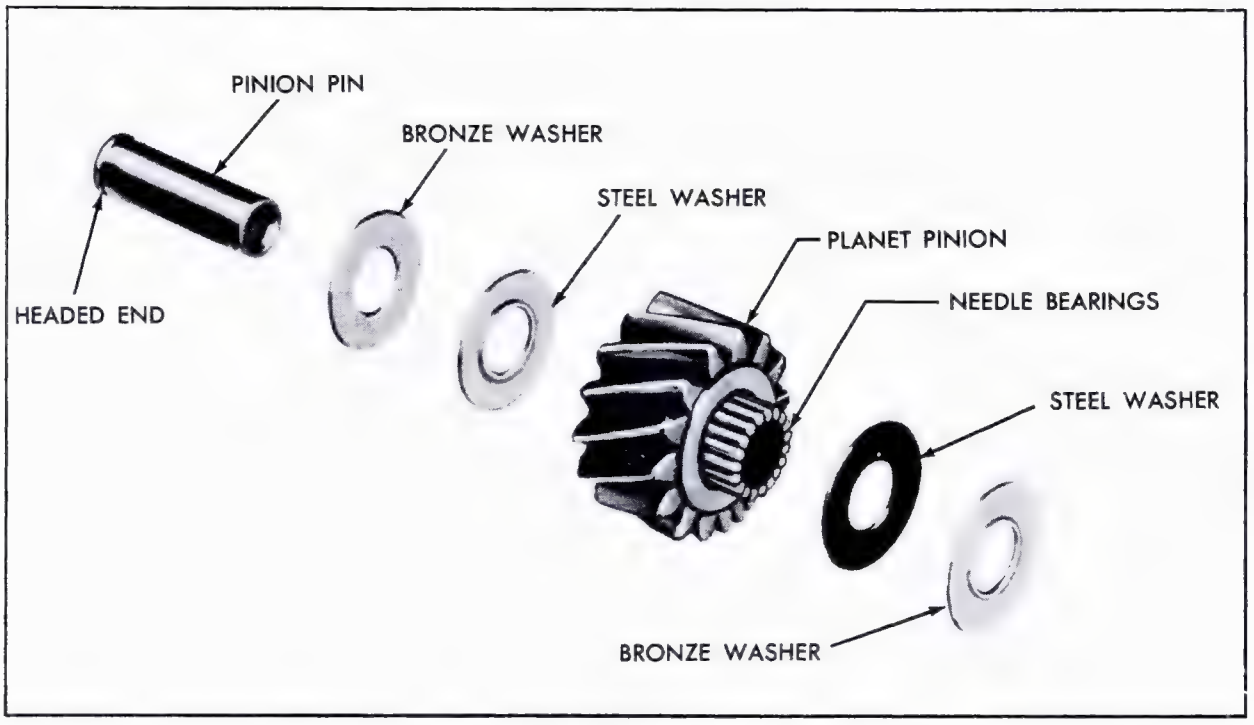


Fig. 7-97 Planet Pinion Assembly Disassembled

3. Lubricate pinion gears in output carrier with transmission fluid and install output carrier on mainshaft so that pinion gears mesh with rear internal gear.

4. Place assembly in Rear Unit Holding Fixture, J-6116, with mainshaft pointing downward. Be careful not to damage shaft.

5. Install races and thrust bearing on outer face of rear internal gear, retaining faces and bearing with petrolatum. Proceed as follows:

a. Install small diameter (flanged I.D.) race first, with flange facing up, Fig. 7-100.

Fig. 7-98 Staking Pinion Pin

b. Install thrust bearing in race.

c. Install large diameter (flanged O.D.) race on bearing with flange cupped over bearing.

6. Install output shaft into output carrier and install snap ring. Install new O-ring on output shaft on AA transmissions only.

CAUTION: The 1969 output flange to output carrier snap ring is flat and thinner then pre-1969 snap rings. The change in design of the 1969 snap ring required a change in the groove of the output carrier. The flat snap ring and pre-1969 snap ring (one side is beveled) are not interchangeable.

7. Invert assembly in Holding Fixture with output shaft pointing downward.

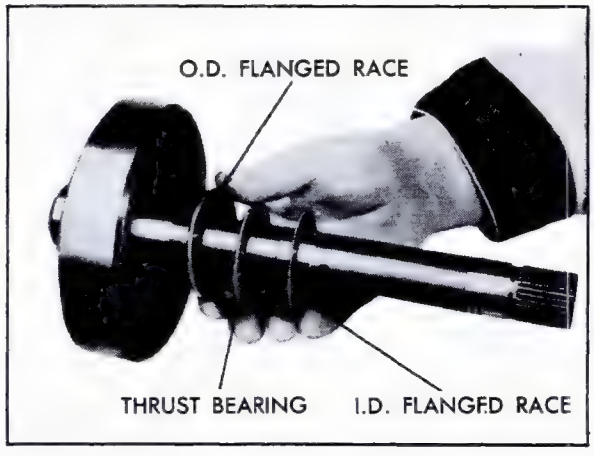


Fig. 7-99 Installing Races and Thrust Bearing on Inner Face of Rear Internal Gear

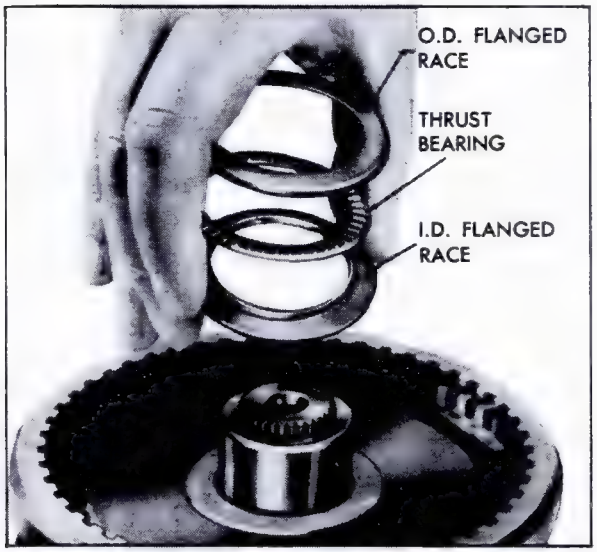


Fig. 7-100 Installing Races and Thrust Bearing on Outer Face of Rear Internal Gear

8. Lubricate tab side of reaction-to-output carrier thrust washer with petrolatum and install thrust washer in output carrier with tabs in tab pockets.

9. Install sun gear with end having chamfered I.D. facing down.

10. Install sun gear shaft with longer splined end down.

11. Install gear ring over output carrier.

12. Lubricate pinion gears in reaction carrier with transmission fluid and install reaction carrier on output carrier, Fig. 7-101, so that pinion gears mesh with front internal gear.

NOTE: When a new output carrier and/or reaction carrier is being installed, and if the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the service ring. The front internal gear ring is a selective fit at the factory but not in service.

13. Install large diameter O.D. race on sun gear with flange facing up against sun gear shaft.

14. Install thrust bearing on race.

15. Lubricate small diameter race with petrolatum and install race on center support with flange facing toward lower end, Fig. 7-102.

16. Lubricate phenolic reaction carrier to center support thrust washer with petrolatum and install washer in recess in center support.

17. Install rollers that may have come out of roller clutch cage, by compressing energizing spring with forefinger and inserting roller from outer side, Fig. 7-103.

Fig. 7-101 Installing Reaction Carrier On Output Carrier

NOTE: Make certain that energizing springs are not distorted, and that curved end leaf of springs are positioned against rollers.

18. Install roller clutch assembly in reaction carrier, Fig. 7-104.

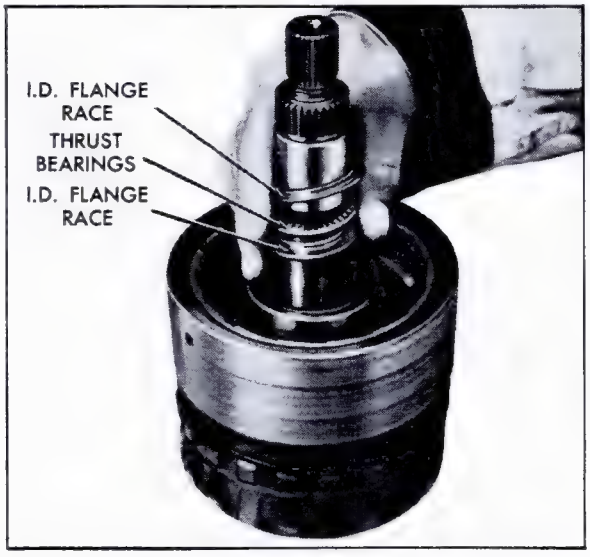


Fig. 7-102 Installing Center Support Races and Thrust Bearing at Sun Gear

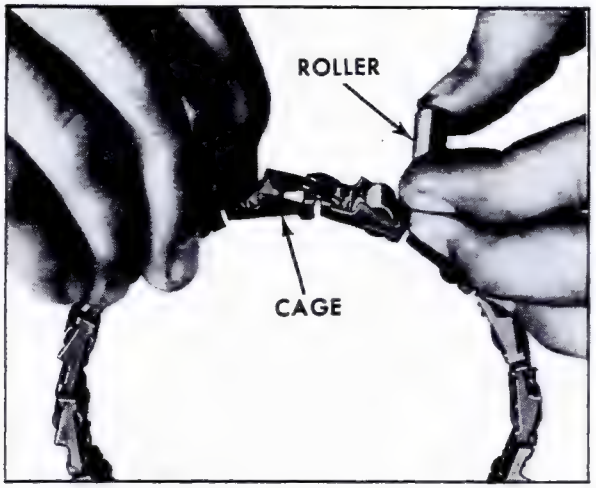


Fig. 7-103 Installing Roller in Roller Clutch Cage

19. Install center support assembly into roller clutch in reaction carrier, Fig. 7-105.

NOTE: With reaction carrier held, center support should turn counterclockwise only.

20. Install Tool J-21365, on end of main shaft so that tangs engage groove in shaft. Tighten screw on tool to secure tool on shaft and prevent movement of the roller clutch during installation of the gear unit assembly.

21. Remove gear unit from Holding Fixture and lay unit on its side. Install thrust washer on rear face of output shaft with bent tabs in tab pockets. Retain thrust washer with petrolatum.

18. Major Transmission Components—Installation

a. Install Parking Pawl

NOTE: The first three steps can be omitted if the parts involved were not removed during disassembly.

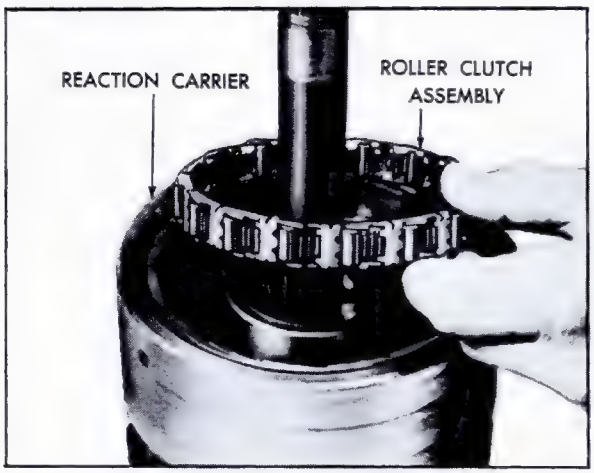


Fig. 7-104 Installing Roller Clutch in Reaction Carrier

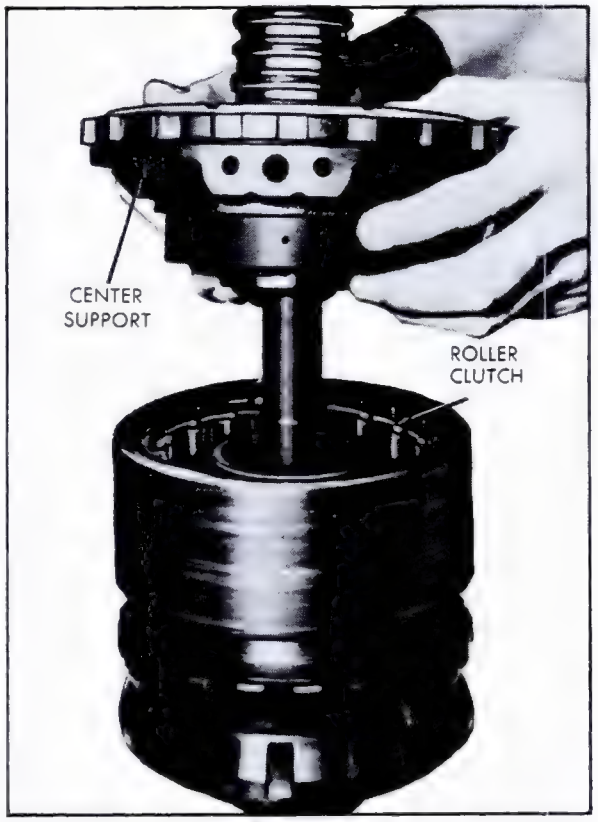


Fig. 7-105 Installing Center Support in Reaction Carrier

1. Install parking pawl, tooth toward center of transmission, and install parking pawl shaft, Fig. 7-106.
2. Install parking pawl shaft retainer clip.
3. Install parking pawl shaft cup plug by driving into the transmission case, using a 3/8 inch diameter rod, until the parking pawl shaft bottoms on the case rib, Fig. 7-107.
4. Install parking pawl return spring with square end hooked on pawl.
5. Install parking pawl bracket with guides over parking pawl, Fig. 7-108. Install two attaching screws, tightening screws to 18 foot-pounds.

b. Install Rear Band and Complete Gear Unit Assembly

1. Inspect rear band for cracks or distortion and band ends for damage at anchor lugs and apply lug. Also inspect lining for cracks, flaking, burning and looseness.
2. Install rear band assembly in transmission case so that band lugs index with anchor pins, Fig. 7-109.
3. Install previously selected rear unit selective washer into slots provided inside rear of transmission case. Retain washer with petrolatum.

NOTE: Proper washer size was determined at time of rear unit end play check (Note 16n).

Fig. 7-106 Installing Parking Pawl and Shaft

4. Place transmission case in Holding Fixture in horizontal position. Do not over-tighten transmission holding fixture side pivot pin as this will cause binding when gear unit is installed.

5. Install proper diameter length of pipe over output shaft to be used as a handle and to prevent spline damage to case bushing when installing gear unit assembly.

Fig. 7-107 Installing Cup Plug

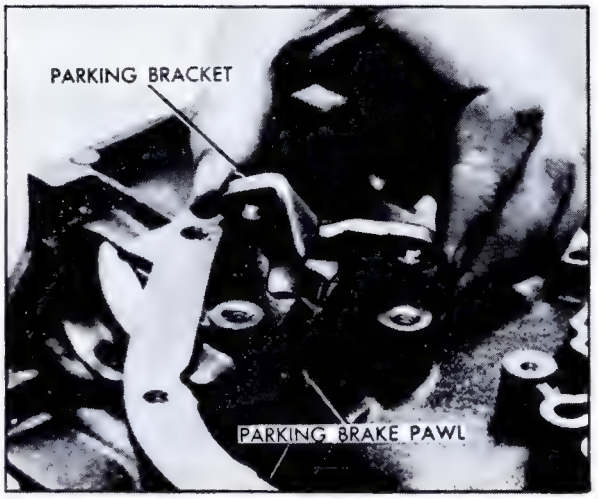


Fig. 7-108 Installing Parking Pawl Bracket

CAUTION: Be careful not to drop or bump assembly in transmission case during installation. This could result in damage to output shaft case bushing as well as to assembly itself.

6. Install gear unit with center support and reaction carrier, by lining up slots and carefully guiding complete assembly horizontally into transmission case, making certain the center support bolt hole is properly aligned with hole in case.

7. Position transmission vertically with front end of case facing upward. Remove tool, J-21365.

8. Lubricate center support to case snap ring with transmission fluid and install snap ring in transmission case with beveled side up, locating gap adjacent to front band anchor pin. Expand snap ring until center support is against shoulder of case.

9. Install case to center support bolt.

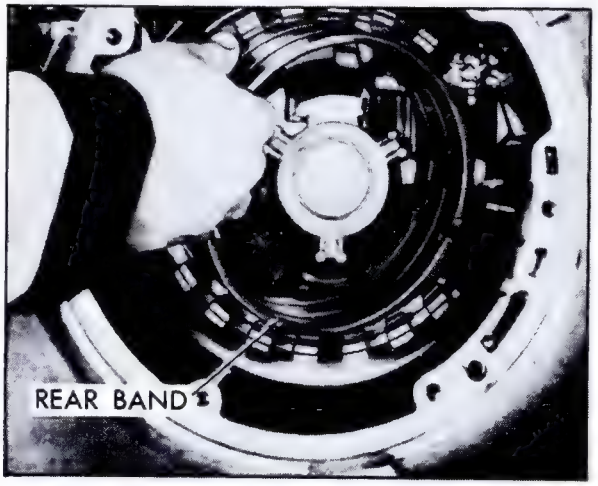


Fig. 7-109 Installing Rear Band Assembly

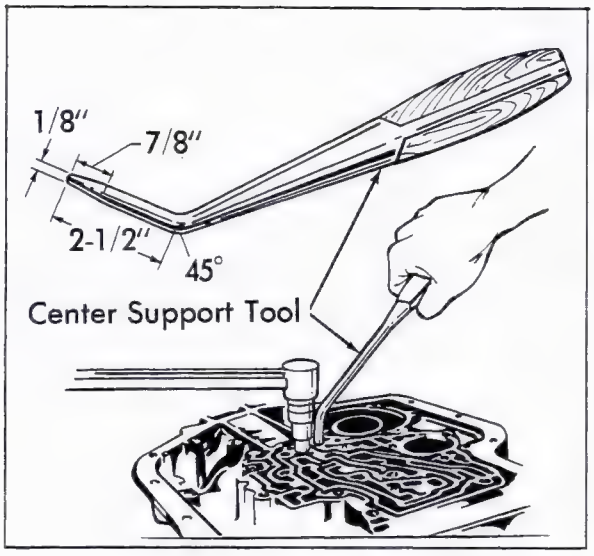


Fig. 7-110 Locating Center Support

NOTE: To correctly perform this operation, it will be necessary to make the tool and follow the installation procedure described below.

Make the tool from 3/8" (.375" diameter) cold roll steel or from a screwdriver with a 3/8" diameter shank. The stock should be approximately 12" long.

Grind the stock to a blunt point, tapering it 7/8" from the end of the bar to a 1/8" diameter at the end, Fig. 7-110.

Bend the bar to a 45° angle 2-1/2" from the pointed end, Fig. 7-110.

Place the center support locating tool into the direct clutch passage in the case, with the handle of the tool pointing to the right as viewed from the front of the transmission and parallel to the bell housing mounting face.

Apply pressure downward on the tool handle, which will tend to rotate the center support counterclockwise as viewed from the front of the transmission. While holding the center support firmly counterclockwise against the case splines, torque the case-to-center support bolt to 23 ft. lbs. using a 3/8" thin wall deep well socket.

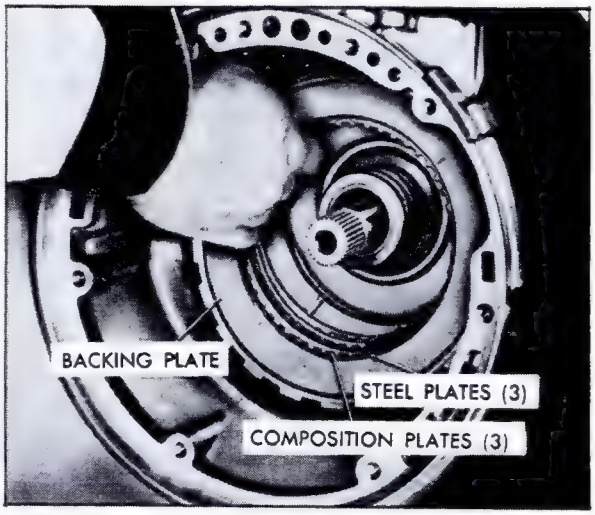


Fig. 7-111 Installing Intermediate Clutch Plates

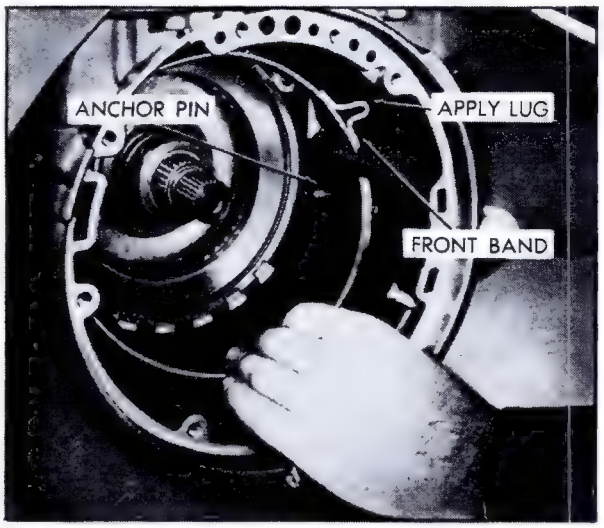


Fig. 7-112 Installing Front Band

CAUTION: When using the locating tool, take care not to raise burrs on the case valve body mounting face.

10. Before installing intermediate clutch plates, inspect plates for signs of burning, scoring, and wear.

11. Lubricate three steel and three composition intermediate clutch plates with transmission fluid and install clutch plates in transmission case, Fig. 7-111. Start with the waved steel plate and alternate composition and steel plates.

12. Install intermediate clutch backing plate with flat machined surface against clutch plates.

13. Install backing plate to case snap ring with snap ring gap on side of case opposite front band anchor pin.

NOTE: Both sides of the snap ring are flat.

14. Recheck rear unit end play as described in Note 16n.

c. Install Front Band and Remaining Clutch Assemblies

1. Inspect front band for cracks or distortion and band ends for damage at anchor lug and apply lug. Also inspect lining for cracks, flaking, burning, and looseness.

2. Install front band with band anchor hole over band anchor pin, and apply lug facing servo hole, Fig. 7-112.

3. Install direct clutch housing and intermediate sprag assembly. Make certain that clutch housing hub bottoms on sun gear shaft and splines on forward end of sun gear shaft are flush with splines in direct clutch housing.

2. Check O-ring on output shaft on AA transmission, for any nicks or flattening and replace O-ring if either condition exists.

3. Secure extension housing to case with six attaching screws. Tighten screws to 23 foot-pounds.

4. If necessary, install a new extension housing oil seal using Oil Seal Installer, J-21359. Apply non-hardening sealer to outside of seal before installation.

g. Install Check Balls, Front Servo Assembly Control Valve Spacer and Gaskets, Detent Solenoid, and Solenoid Connector

1. Install front servo spring and retainer into transmission case.

2. Install flat washer on front servo pin on end opposite taper, and install pin into case so that tapered end contacts band.

3. Install seal ring on servo piston, if removed, and install on apply pin with identification numbers on shoulder positioned toward bottom pan.

4. Check freeness of piston by stroking it in bore.

5. Install six check balls into ball seat pockets in transmission case, Fig. 7-115.

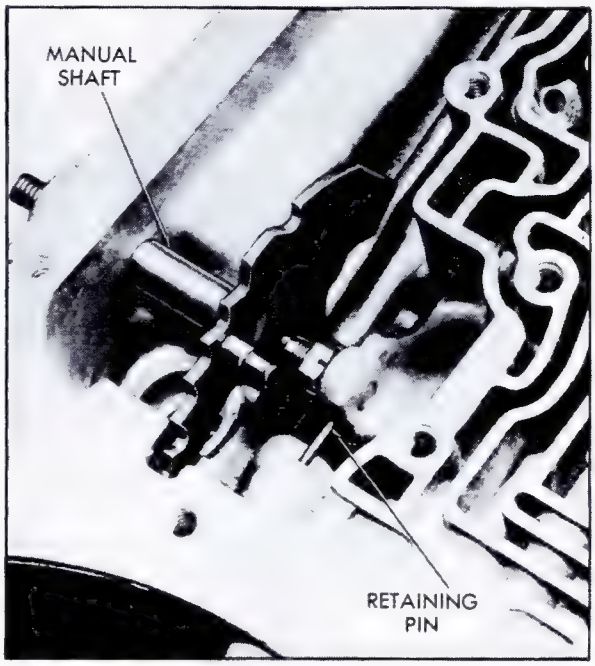


Fig. 7-115 Installing Manual Shaft Retaining Pin

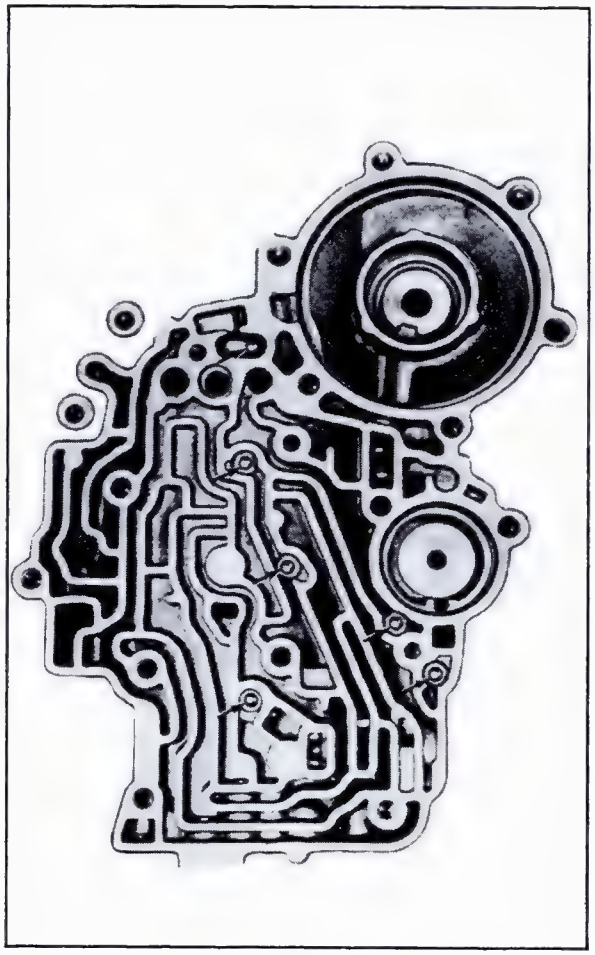


Fig. 7-116 Location of Check Balls

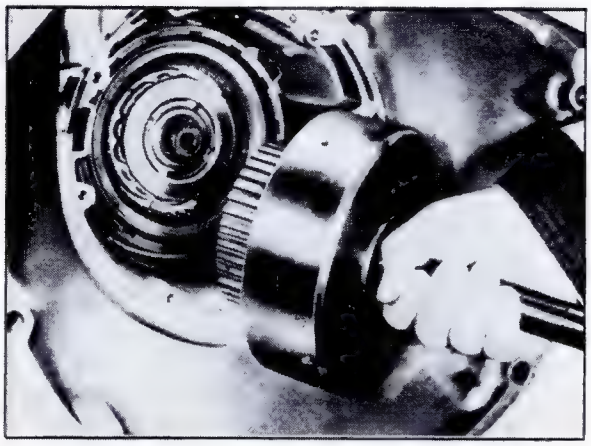


Fig. 7-113 Installing Forward Clutch Assembly

NOTE: It will be necessary to rotate clutch housing to allow sprag outer race to index with intermediate clutch composition-faced plates. Removal of direct clutch composition and steel plates may be helpful and applying air pressure through the center support screw to apply the intermediate clutch plates may facilitate assembly.

4. Install forward clutch hub to direct clutch housing thrust washer on forward clutch hub. Retain with petrolatum.

5. Position transmission horizontally in Holding Fixture and install forward clutch assembly and turbine shaft, Fig. 7-113. Make certain end of main shaft goes all the way into forward clutch hub. It will be necessary to rotate clutch housing to allow direct clutch driving hub to index with direct clutch composition plates. When forward clutch is seated, it will be approximately 1-1/4 inches from pump mounting face in case.

NOTE: Missing internal splines in forward clutch hub are lubrication passages and do not have to be indexed with any particular spline on main shaft.

d. Install Oil Pump

1. Lubricate turbine shaft journals with transmission fluid and lubricate hook-type oil rings on pump delivery sleeve with petrolatum.

2. Install Slide Hammer Bolts, J-6125-1, through two opposite unthreaded holes in pump assembly to serve as guide pins when installing pump.

3. Properly align pump to case gasket on case mounting face.

4. Position pump assembly in transmission case and thread Slide Hammer assemblies into their corresponding threaded holes in transmission case.

5. Install pump assembly in transmission case. Do not remove slide hammer bolts until last two pump attaching screws are installed.

6. Using eight new rubber-coated washers on pump attaching screws, install all but one attaching screw at either 5 o'clock or 10 o'clock position so that front unit end play can be rechecked. Tighten screws to 18 foot-pounds.

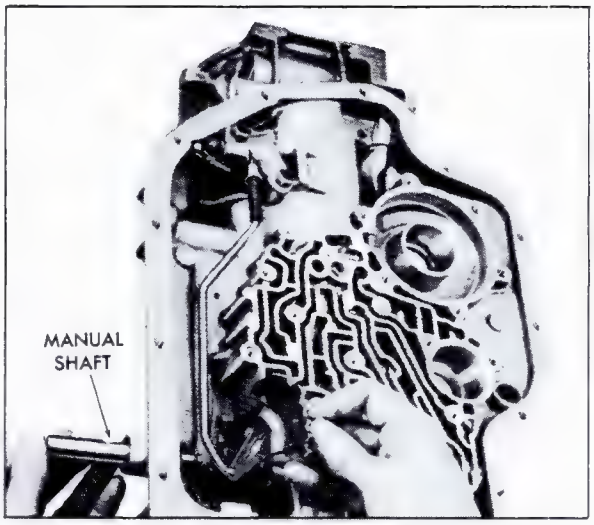


Fig. 7-114 Installing Manual Shaft

NOTE: If turbine shaft cannot be rotated as pump is being pulled into place, the forward or direct clutch housings have not been installed properly to index with all the clutch plates. This condition must be corrected before pump is pulled fully into place.

7. Recheck front unit end play as described in Note 16j.

8. Install remaining pump attaching screw using new rubber coated washer. Tighten screw to 18 foot-pounds.

9. If necessary, install new front seal using Pump Oil Seal Installer, J-21359.

e. Install Parking Linkage, Detent Lever, and Manual Shaft

1. If removed, install a new manual shaft seal into the case using a 3/4 inch diameter rod to seat the seal.

2. Insert actuator rod into manual detent lever from side opposite pin.

3. Install actuator rod plunger under parking bracket and over parking pawl.

4. Install manual shaft assembly into case and through detent lever, Fig. 7-114.

5. Install locknut on manual shaft. Tighten nut to 18 foot-pounds.

6. Install external manual yoke on manual shaft. Tighten nut to 18 foot-pounds.

7. Install retaining pin in case, indexing it with groove in manual shaft, Fig. 7-115.

NOTE: If procedure is being performed with transmission in car, install and straighten bent pin.

f. Install Extension Housing

1. Install new gasket on extension housing, retaining with petrolatum.

NOTE: If operation is being performed on car, install check balls into ball seat pockets on spacer plate.

6. Install control valve spacer to case gasket (gasket with extension for detent solenoid).
7. Install control valve spacer.
8. Install detent solenoid gasket.
9. Install detent solenoid assembly with connector facing outer edge of case. Do not tighten screws at this time.
10. Install control valve to spacer gasket.
11. Install new O-ring on solenoid connector.
12. Install connector with lock tabs pointing into case. Position locator tab in notch on side of case.
13. Connect detent solenoid to connector terminals, Fig. 7-117.

h. Install Rear Servo Assembly

1. Lubricate inner and outer rear servo bores in transmission case with transmission fluid and install rear accumulator spring in servo inner bore.

NOTE: Before installing rear servo assembly, make certain that rear band apply lug is aligned with servo pin bore in transmission case. Otherwise servo pin will not apply band.

2. Position rear servo assembly in transmission.
3. Press down on rear servo assembly, making certain it is properly seated in case bore, and install rear servo cover and new gasket. Install six attaching screws, tightening screws to 18 foot-pounds.

i. Install Control Valve Assembly

1. Install governor pipes on control valve assembly. Governor pipes are interchangeable.
2. Using two control valve assembly attaching screws with heads cut off as guide pins, Fig. 7-118, install control valve assembly and governor pipes on transmission. Make certain gaskets and spacer do not become mispositioned.

NOTE: Check manual valve to make sure it is indexed properly with pin on detent lever and

Fig. 7-117 Installing Detent Solenoid Wire

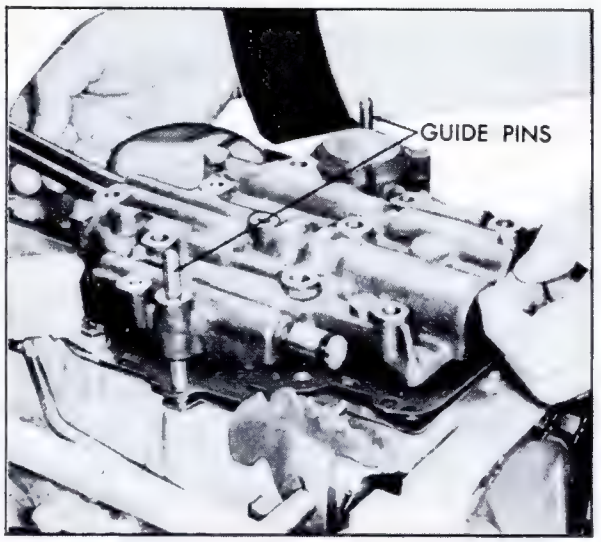


Fig. 7-118 Installing Control Valve Assembly

governor pipes to make certain they are properly seated in case holes.
3. Remove guide pins and start control valve assembly attaching screws, including detent spring and roller assembly attaching screw, Fig. 7-119. Torque screws to 8 foot-pounds.
4. Tighten detent solenoid attaching screws to 10 foot-pounds.

j. Install Modulator Valve and Vacuum Modulator

1. Install modulator valve into case with stem end out.
2. Install new O-ring on vacuum modulator.
3. Install vacuum modulator into case with vacuum hose pipe facing front of car and angled 5° toward top of case.
4. Install modulator retainer with curved side of tangs inboard and install attaching screw. Tighten screw to 18 foot-pounds.

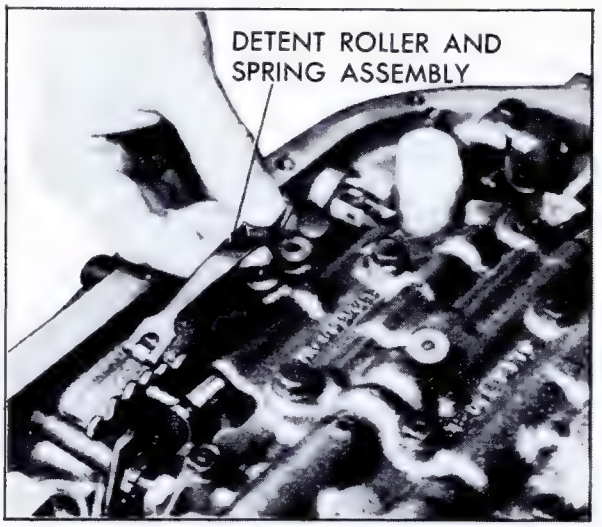


Fig. 7-119 Installing Detent Spring and Roller Assembly

Series	Transmission Letter Code	Rear Axle Ratio	Driven Gear Teeth	Drive Worm Gear Teeth	Sleeve Tooth Range	Color of Gear	Tire Size
680, 681 682, 683	AA	2.94:1	38	18	36-39	Blue	9.00
697	AB	3.21:1	43	19	40-43	Purple	8.20
698	AB	3.21:1	41	19	40-43	Yellow	8.90

k. Install Governor Assembly

1. Install governor assembly into case.
2. Using a new gasket, attach governor cover to case with four attaching bolts, torque bolts to 18 foot-pounds.

l. Install Speedometer Driven Gear Assembly

Speedometer driven gears are provided in three different tooth sizes as well as two different sleeve sizes. Driven gear must be installed in sleeve having tooth range corresponding to number of teeth in gear. Refer to chart above to select proper gear.

1. Check number of teeth stamped on nylon gear. Locate corresponding tooth range on outside face of sleeve and install sleeve and driven gear with tooth range numbers on outside face of sleeve toward bottom of transmission, Fig. 7-120.
2. Install speedometer driven gear retainer with tangs in sleeve positioning bosses, and install attaching screw. Tighten screw to 18 foot-pounds.

m. Install Intake Pipe and Strainer Assembly and Bottom Pan

1. Install new intake pipe O-ring onto pipe and install pipe assembly into new strainer assembly.
2. Install strainer and intake pipe assembly into case bore, Fig. 7-51.
3. Install strainer retainer bolt, Fig. 7-52.
4. Install new gasket on bottom pan and install bottom pan.
5. Install thirteen bottom pan attaching screws. Tighten screws to 12 foot-pounds.

n. Install Converter

1. Install converter on turbine shaft making certain that converter drive hub slots are fully engaged with the pump drive gear tangs.
2. Install Converter Holding Clamp, J-21366, on front of transmission case, Fig. 7-45.

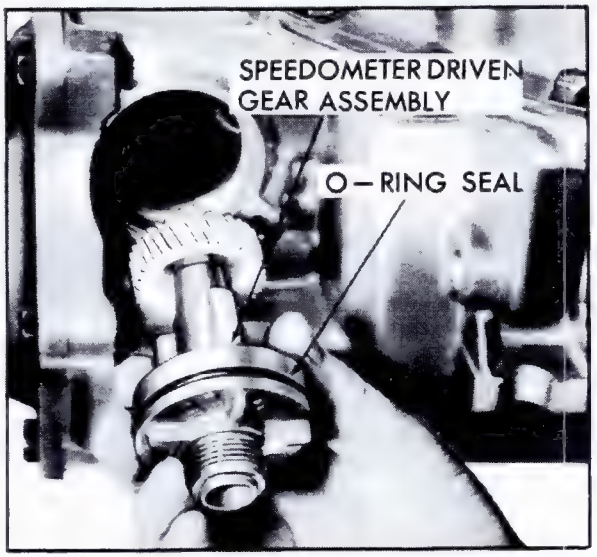


Fig. 7-120 Installing Speedometer Driven Gear

TORQUE SPECIFICATIONS

Material Number	Application	Thread Size	Foot Pounds
280M	Solenoid to Case Screw	1/4-20	10
260M	Control Valve Assembly to Case Screw	1/4-20 5/16-18	8
280M	Exhaust Brace to Transmission Screw	5/16-18	
301M	Exhaust Brace to Transmission Nut.	5/16-18	15
Special	Line Pressure Plug	1/8 Pipe	10
601M	Lower Cover to Transmission Screw	1/4-20	8
280M	Pump Body to Cover Screw	5/16-18	18
280M	Pump Assembly to Case Screw	5/16-18	18
280M	Rear Servo Cover to Case Screw	5/16-18	18
260M	Governor Cover to Case Screw	5/16-18	18
280M	Parking Pawl Bracket to Case Screw	5/16-18	18
260M	Vacuum Modulator Retainer to Case Screw	5/16-18	18
260M	Speedometer Driven Gear Retainer to Case Screw	5/16-18	18
1010-1020	Bottom Pan to Case Screw	5/16-18	12
260M	Extension Housing to Case Screw	3/8-16	23
286M	Manual Shaft to Detent Lever Nut.	3/8-24	18
286M	Manual Yoke to Manual Shaft Nut	3/8-16	18
300M	Case to Center Support - Support Bolt	3/8-16	23
300M	Flex-Plate to Converter Bolt	3/8-16	30
280M	Transmission Case to Engine Screw	3/8-16	30
Steel	Oil Cooler Pipe Connector Nut at Case	5/8-18	28
Brass	Cooler Pipe Connector at Case	1/4-18	28
280M	Engine Rear Mount Screw	7/16-14	55
280M	Engine Rear Support Bracket to Frame Bolt	3/8-24	30
286M	Engine Front Cushion to Frame Nut	1/2-20	90

NOTE: Refer to back of Manual, Page 16-1, for bolt and nut markings and steel classifications.

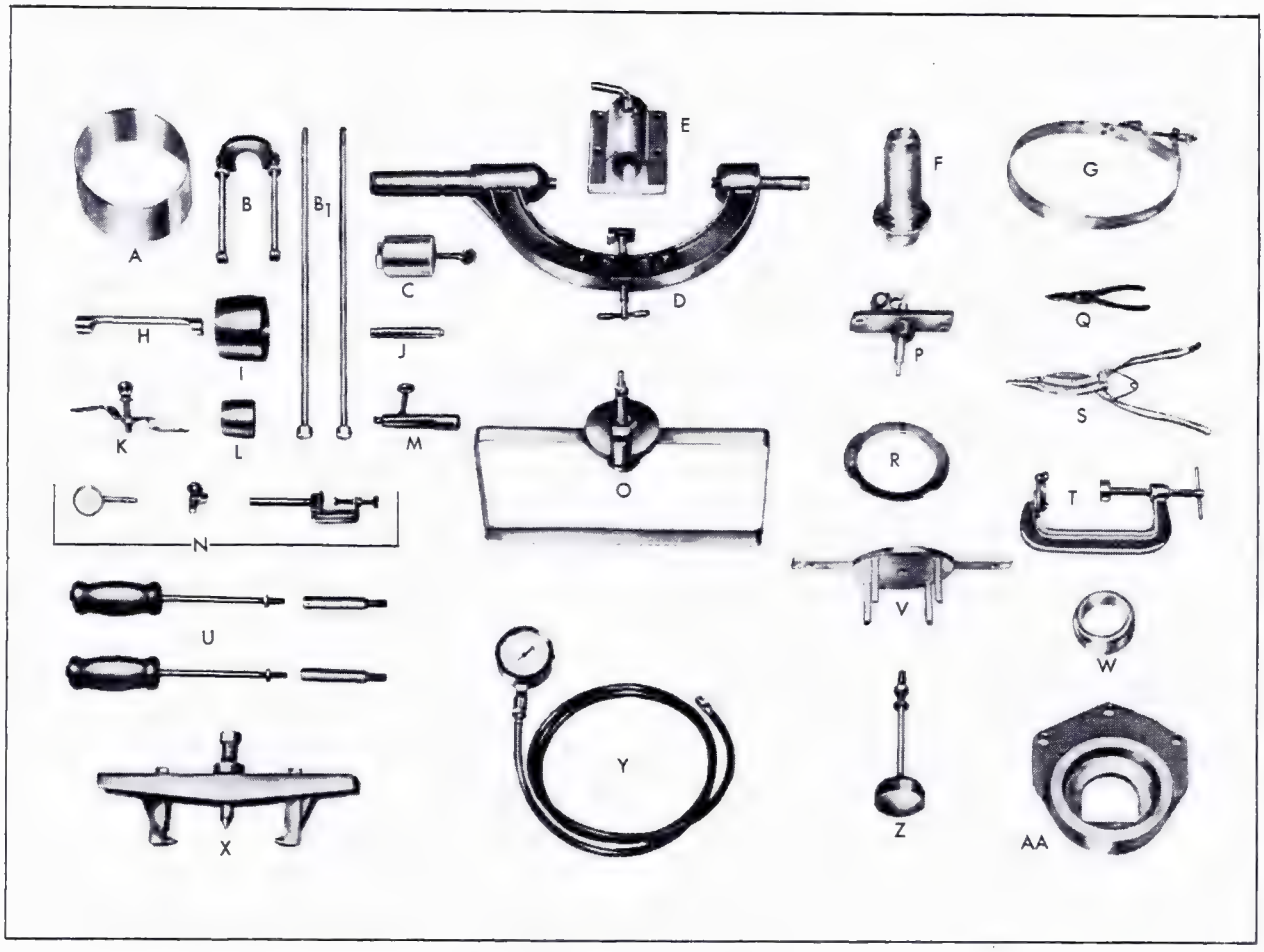


Fig. 7-121 Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-21409	Forward and Direct Clutch Piston Installer	N	J-8001	Dial Indicator Set
			O	J-21369	Converter Leak Test Fixture
B	J-21427	Speedometer Drive Gear Remover	P	J-21370	Band Apply Pin Selector Gage (Use J-21370-5 Pin)
B1	J-21797	Speedometer Drive Gear Remover Bolts	Q	J-5403	Snap Ring Pliers (#21)
			R	J-21664	Clutch Spring Compressor Adapter
C	J-21795	Gear Assembly Remover and Installer Adapter	S	J-8059	Snap Ring Pliers
D	J-8763	Transmission Holding Fixture	T	J-21885	Control Valve Accumulator Piston Installer
E	J-3289-01	Holding Fixture Base			
F	J-21359	Pump Oil and Extension Housing Seal Installer	U	J-6125	Slide Hammer Assemblies
G	J-21368	Pump Body and Cover Alignment Band	V	J-4670	Clutch Spring Compressor
H	J-21477	Oil Cooler Pipe Wrench	W	J-21364	Rear Unit Holding Fixture Adapter
I	J-21363	Intermediate Clutch Inner Seal Protector	X	J-8433	Pulley Puller
J	J-21360	Pump Check Valve Seat Installer	Y	J-5907	0-300 PSI Pressure Gage
K	J-21366	Converter Holding Clamp	Z	J-6129	Rear Clutch Spring Compressor
L	J-21362	Forward and Direct Clutch Inner Seal Protector	AA	J-6116	Rear Unit Holding Fixture
M	J-21361	Pump Check Valve Seat Remover			

GENERAL INFORMATION

NOTE: The following information pertains only to the Fleetwood Eldorado.

The Turbo Hydra-matic transmission, Fig. 7-122 used on the Fleetwood Eldorado is a fully automatic transmission used for front wheel drive applications.

The Turbo Hydra-matic transmission consists primarily of a three-element hydraulic torque converter, a dual sprocket and link assembly and a compound planetary gear set. Three multiple-disc clutches, a sprag unit, a roller clutch unit, and two bands provide the friction elements required to obtain the desired functions of the compound planetary gear set.

The torque converter, the dual sprocket and link, the clutches, the sprag and roller clutch, couple the engine to the planetary gears, providing three forward speeds and reverse. The torque converter, when required, will supplement the gears by multiplying engine torque.

The torque converter is of welded construction

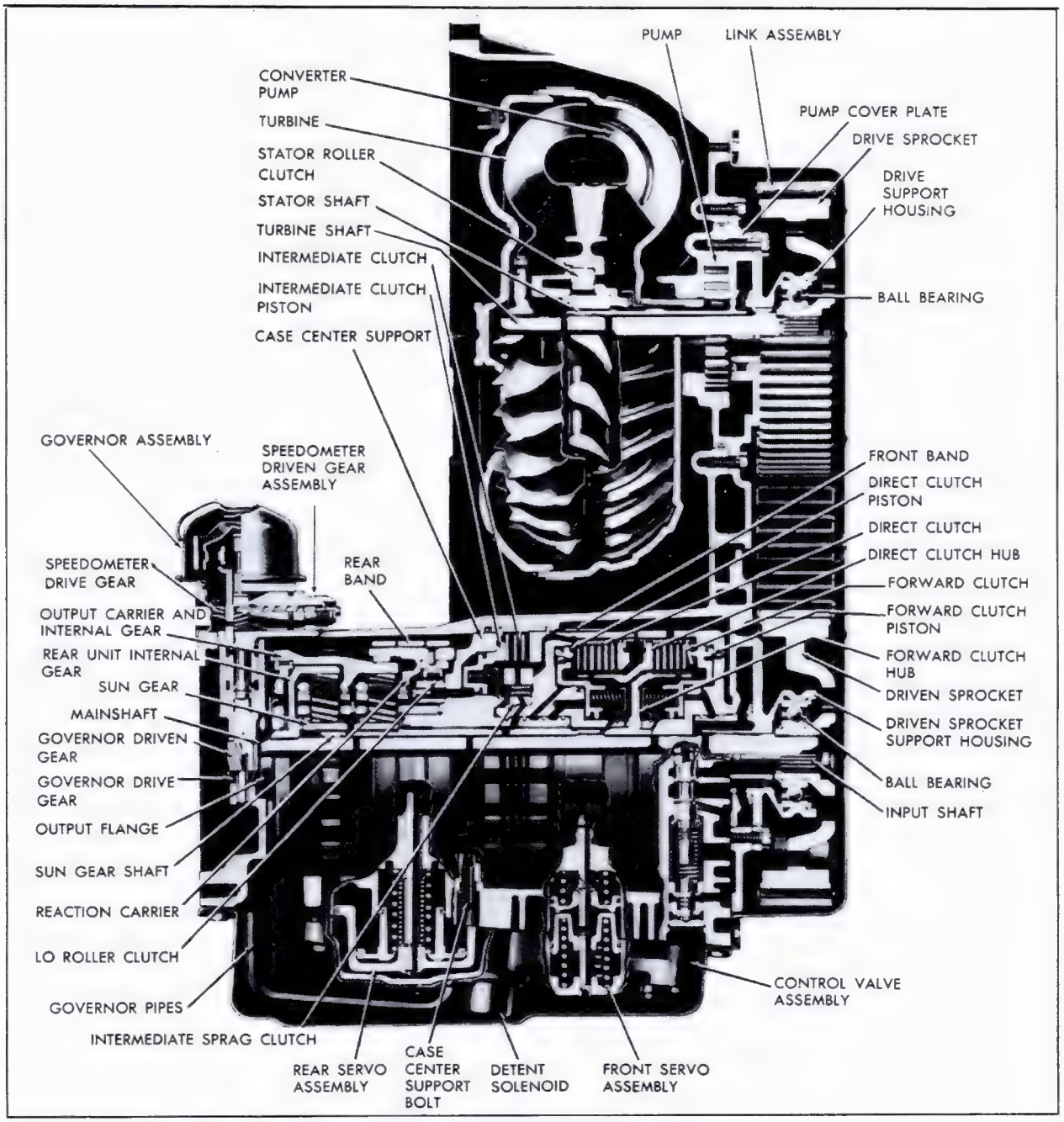


Fig. 7-122 Turbo Hydra-matic Transmission Cutaway

and is serviced as an assembly. The unit is made up of two vaned sections, or halves, that face each other in an oil filled housing. The pump half of the converter is connected to the engine and the turbine half is, in effect, connected to the transmission.

The torque converter couples the engine to the planetary gear set through the use of a drive sprocket, a link assembly, and a driven sprocket. Clockwise engine torque turns the drive sprocket clockwise, which, in turn, drives the driven sprocket in a clockwise direction. This in effect is a reverse in the direction of engine torque due to the side mounting of the gear unit.

When the engine makes the converter pump revolve, it sends oil against the turbine, making it revolve also. The oil then returns in a circular flow back to the converter pump, continuing this flow as long as the engine is running.

The converter also has a smaller vaned section, called a stator, that funnels the oil back to the converter pump through smaller openings, at increased speed. The speeded up oil directs additional force to the engine-driven converter pump, thereby multiplying engine torque.

A hydraulic system pressurized by an internal-external type gear pump provides the working pressure required to operate the friction elements and automatic controls.

External control connections to the transmission are:

Manual Linkage - To select the desired operating range.

Engine Vacuum - To operate a vacuum modulator unit.

12 Volt Electrical Signal - To operate an electrical detent solenoid.

Gear or Torque ratios of the transmission are as follows:

First	=	2.48:1 gear ratio
Second	=	1.48:1 gear ratio
Third	=	1.0:1 gear ratio
Reverse	=	2.08:1 gear ratio

Each gear ratio can be multiplied by as much as 2, depending upon the slip speed of the converter pump and turbine.

A vacuum modulator is used to sense engine torque input to the transmission automatically. The vacuum modulator transmits this signal to the pressure regulator, which controls line pressure, so that all torque requirements of the transmission are met and proper shift spacing is obtained at all throttle openings.

The detent solenoid is activated by a switch at the carburetor. When the throttle is opened sufficiently to close this switch, the solenoid in the transmission is activated, causing a downshift at speeds below approximately 70 miles per hour. At lower speeds, downshifts will occur at lesser throttle openings without use of the switch.

The oil cooler is located in the right hand tank of the radiator. The transmission is cooled by directing oil from the converter to the radiator. Oil returning from the radiator feeds the transmission lubrication system.

The oil system incorporates an intake pipe and strainer assembly. The strainer assembly should be replaced after the first 24,000 miles or two years, whichever occurs first. It should be replaced after the first 12,000 miles if heavy duty operation is encountered; such as constant use in heavy metropolitan traffic, pulling trailers, etc. In addition, replace strainer assembly when a major transmission failure occurs. In the event of a major transmission failure, the converter assembly should be replaced, and the oil cooler and lines should be flushed.

The transmission quadrant has six selector positions, that enable the driver to control the operation of the transmission under various driving conditions. The six selector positions appear on the quadrant in the following sequence, from left to right; P-park, R-reverse, N-neutral, DRIVE left, DRIVE right (intermediate) and L-lo.

P - Park position positively locks the output flange to the transmission case by means of a locking pawl and prevents the vehicle from rolling either forward or backward. For this reason, it is recommended that the engine be started with transmission selector lever in Park position. If it is necessary to re-start the engine with car rolling, place selector lever in Neutral.

R - Reverse enables the vehicle to be operated in a reverse direction.

N - Neutral position enables the engine to be started and run without driving the vehicle. It is recommended that Neutral be used to start the engine only if it is necessary to re-start the engine with the car rolling. At all other times use Park.

Drive (left) - Drive (left) is used for all normal driving conditions and maximum economy. Drive (left) has three gear ratios from starting to direct drive. Downshifts are available for safe passing, by depressing the accelerator pedal.

Drive (right) - Drive (right) adds performance

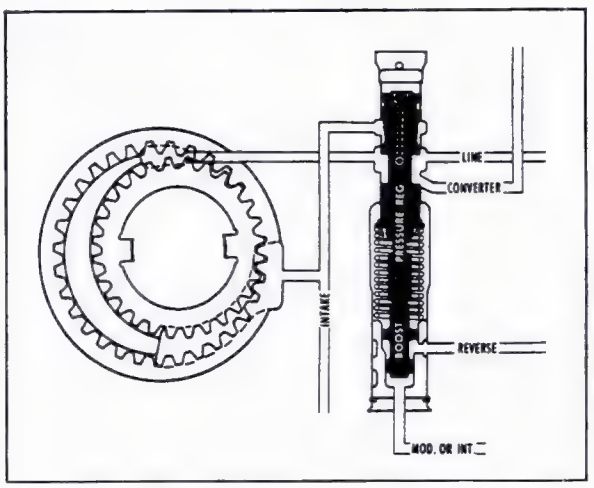


Fig. 7-123 Pressure Control

for congested traffic or hilly terrain. This range has the same starting ratio as Drive (left), but prevents the transmission from shifting above second speed to retain acceleration when extra performance is desired. Additional engine braking is provided in this range.

L - Lo range permits operation at a lower gear ratio, and should be used where maximum torque multiplication is desired, such as in pulling a heavy load or descending a steep grade. When selector lever is moved from Drive to Lo range at normal highway speeds, the transmission will shift to second gear and remain in second gear until vehicle speed is reduced to approximately 45 mph. The transmission will then shift to first gear and remain in first gear regardless of vehicle or engine speed, until selector lever is moved back into either of the Drive positions.

Pressure Control

The transmission is controlled automatically by a hydraulic system, Fig. 7-123. Hydraulic pressure is supplied by the transmission oil pump, which is engine driven. Main line pressure is controlled by a pressure regulator valve train located in the transmission case and by the vacuum modulator which is connected to engine vacuum. The pressure regulator controls line pressure automatically, in response to a pressure signal from a modulator valve in such a way that the torque requirements of the transmission clutches are met and proper shift spacing is obtained at all throttle openings.

HYDRAULIC SYSTEM DESCRIPTION

To control line pressure properly, modulator pressure is used which varies in the same manner as torque input to the transmission. Since the torque input to the clutches is the product of engine torque and converter ratio, modulator pressure must compensate for changes in either or both of these.

To meet these requirements, modulator pressure is regulated by engine vacuum, which is an indicator of engine torque and carburetor opening. It will decrease with an increase in vehicle speed to compensate for the changing converter torque ratio, by virtue of the governor pressure influence.

Vacuum Modulator Assembly

The engine vacuum signal is received by the vacuum modulator, Fig. 7-124, which consists of an evacuated metal bellows, a diaphragm and a spring. These are so arranged that the bellows and spring apply a force that acts on the modulator valve so that it increases modulator pressure.

Engine vacuum and the enclosed spring oppose the bellows and spring to control modulator pressure.

To reduce the effect of altitude on shift points, the effective area of the diaphragm is different than that of the bellows. Atmospheric pressure acts on the resulting differential area to reduce modulator pressure.

Governor Assembly

The vehicle speed signal to the transmission is supplied by the governor, which is driven by the output flange. The governor consists of flyweights and a regulator valve. Centrifugal force of the flyweights is imposed on the regulator valve, causing it to regulate a pressure signal that increases with speed.

Governor pressure acts on the modulator valve to cause modulator pressure to decrease as vehicle speed increases.

Functions of Valves and Hydraulic Control Units

The valves in the Turbo Hydra-matic transmission used on the Cadillac Eldorado function and are located identically to their corresponding valves in the regular Turbo Hydra-matic transmission with the following exceptions:

1. The pressure regulator valve is located in the transmission case. The valve functions as a regulator of line pressure. The bottom pan must be removed to service this valve located in the right rear corner of the case valve body mounting pad.
2. The modulator valve has a case to valve bushing in which it operates.
3. The governor is mounted with a clip, an external stamped housing, and a square cut O-ring seal.

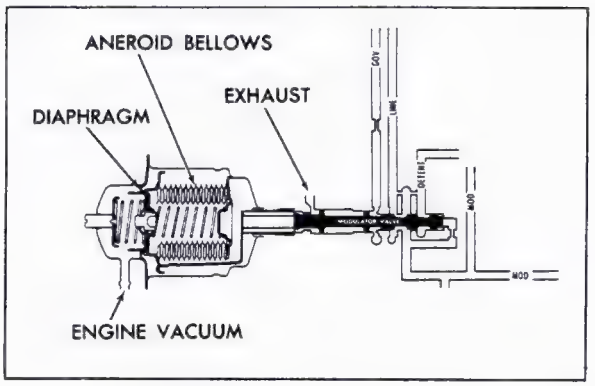


Fig. 7-124 Vacuum Modulator Assembly

PARK OR NEUTRAL—ENGINE RUNNING POWER FLOW

Forward Clutch - Released
Roller Clutch - Ineffective
Direct Clutch - Released
Front Band - Released
Rear Band - Released
Intermediate Clutch - Released
Intermediate Sprag - Ineffective

In Neutral or Park no bands or clutches are applied, therefore no power is transmitted.

OIL FLOW (Fig. 7-125)

Whenever the engine is running at idle with the selector lever in "P" or "N", oil from the pump is directed to the:

1. Converter
   a. Oil Cooler
   b. Lubrication System
2. Vacuum Modulator Valve
   a. Pressure Regulator Boost Valve
   b. 1-2 Accumulator and Primary Valves
   c. Detent Valve
   d. 3-2 Valve
   e. 2-3 Shift Valve Train
   f. 1-2 Shift Valve Train
3. Manual Valve
4. Detent Solenoid
5. Detent Valve
6. Front Servo Piston (Neutral only)

Cooling and Lubrication

Oil flows from the pump to the pressure regulator valve which regulates pump pressure. When the pump output exceeds the demand of line pressure, oil from the pressure regulator is directed to the converter feed passage to fill the converter. Oil from the converter is directed to the transmission cooler. Oil from the cooler is directed to the transmission lubrication system.

Line pressure acts on the:

1. Manual Valve
2. Detent Valve
3. Detent Solenoid
4. Modulator Valve
5. Front Servo Piston

Line pressure at the modulator valve is regulated to a pressure called modulator oil, which acts on the pressure boost valve, 1-2 accumulator and primary valves, and passes through the detent valve and 3-2 valve to the 1-2 and 2-3 valve trains.

Summary

The converter is filled. All clutches and bands are released. The transmission is in Neutral.

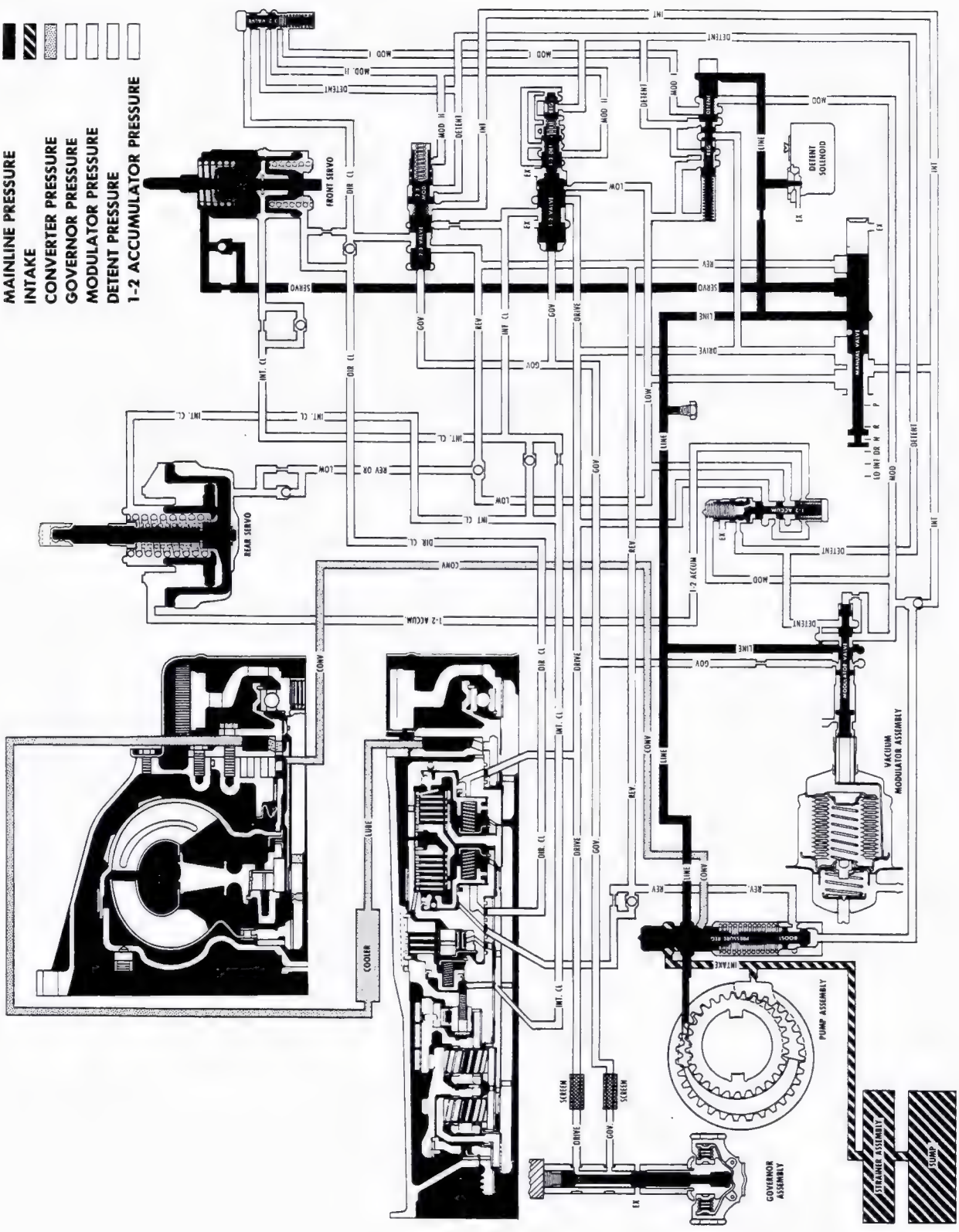


Fig. 7-125 Neutral - Engine Running

DRIVE LEFT AND RIGHT—FIRST SPEED POWER FLOW (Fig. 7-126)

Forward Clutch - Applied
Roller Clutch - Effective
Direct Clutch - Released
Front Band - Released
Rear Band - Released
Intermediate Clutch - Released
Intermediate Sprag - Ineffective

With the selector lever in either Drive Range, the forward clutch is applied. This delivers turbine torque to the drive sprocket, through the link assembly to the driven sprocket and mainshaft and turns the rear internal gear in a counterclockwise direction. (Converter torque ratio = approximately 2:1 at stall.)

Counterclockwise motion of the rear internal gear causes the rear pinions to turn counterclockwise to drive the sun gear clockwise. In turn, the sun gear drives the front pinions counterclockwise, thus turning the front internal gear, output carrier, and output flange counterclockwise in a reduction ratio of approximately 2.48:1. Reaction of the front pinions against the front internal gear is taken by reaction carrier and roller clutch assembly to the transmission case. (Approximate stall ratio - 5:1).

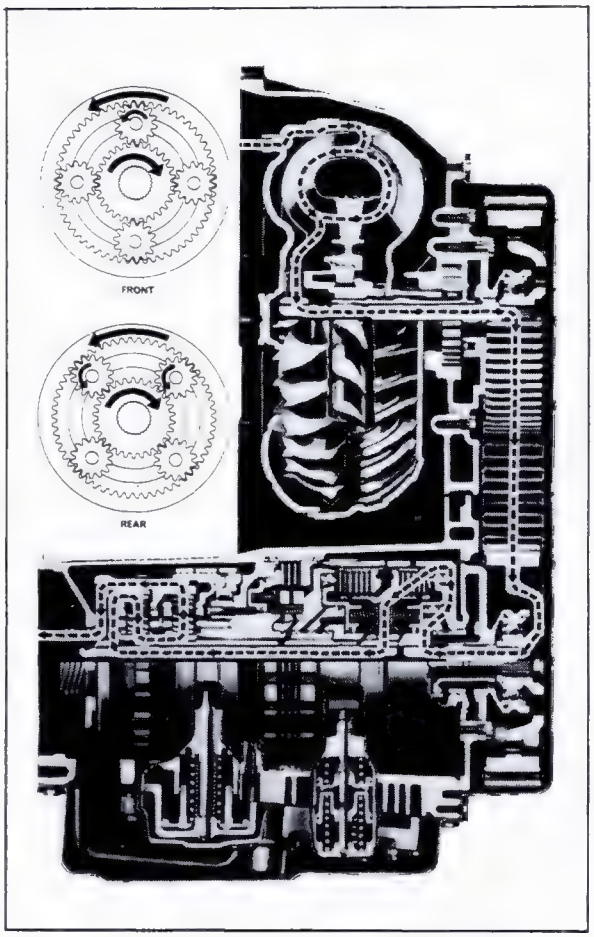


Fig. 7-126 Drive Range - First Gear

OIL FLOW (Fig. 7-127)

When the selector lever is moved to either Drive position, the manual valve is repositioned to allow line pressure to enter the drive circuit. Drive oil then flows to the:

1. Forward Clutch
2. 1-2 Shift Valve
3. Governor Assembly
4. 1-2 Accumulator Valve
5. Detent Regulator Valve

Basic Control

Drive oil is directed to the forward clutch where it acts on two areas of the clutch piston to apply the forward clutch. The first, or inner area, is fed through an unrestricted passage. The outer area is fed through an orifice to insure a smooth shift into Drive.

Drive oil at the governor assembly is regulated to a variable pressure. This pressure increases with vehicle speed and acts against the ends of the 1-2 and 2-3 shift valves and an area on the modulator valve.

Drive oil is also regulated to another variable pressure at the 1-2 accumulator valve. This pressure is controlled by modulator oil and is directed to the rear accumulator piston. In addition, to maintain the lower pressure in the 1-2 accumulator passage, the 1-2 accumulator valve intermittently uncovers the lo oil passage and oil is exhausted at the manual valve.

Summary

The converter is filled. The forward clutch is applied. The transmission is in first gear.

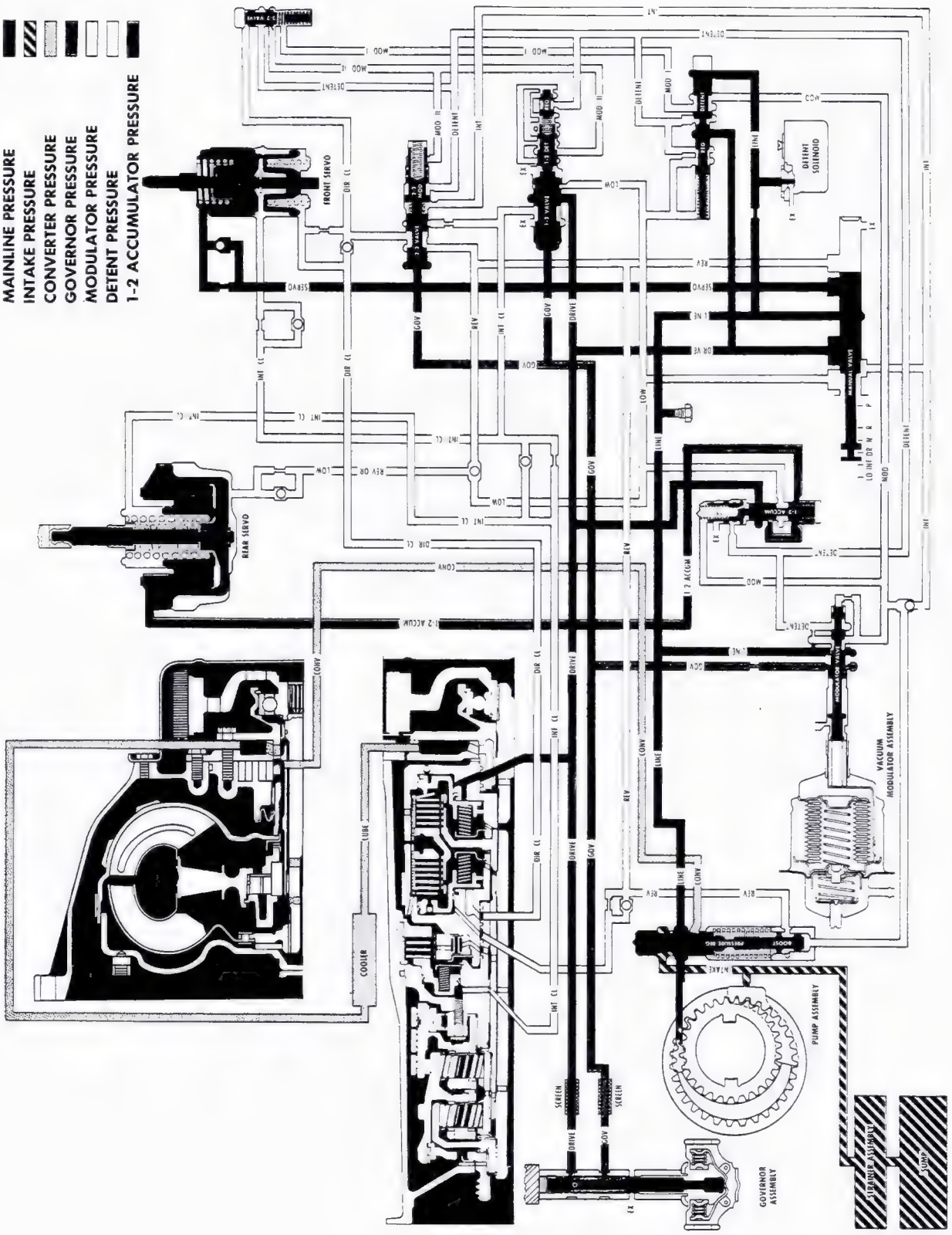


Fig. 7-127 Drive Range - First Gear

DRIVE (LEFT)—SECOND SPEED POWER FLOW (Fig. 7-128)

Forward Clutch - Applied
Roller Clutch - Ineffective
Direct Clutch - Released
Front Band - Released
Rear Band - Released
Intermediate Clutch - Applied
Intermediate Sprag - Effective

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque through the forward clutch is now applied through the drive sprocket, link assembly and driven sprocket to the mainshaft to the rear internal gear in a counterclockwise direction. Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.48:1.

NOTE: Further reduction is possible, at low speeds, due to the torque multiplication provided by the converter.

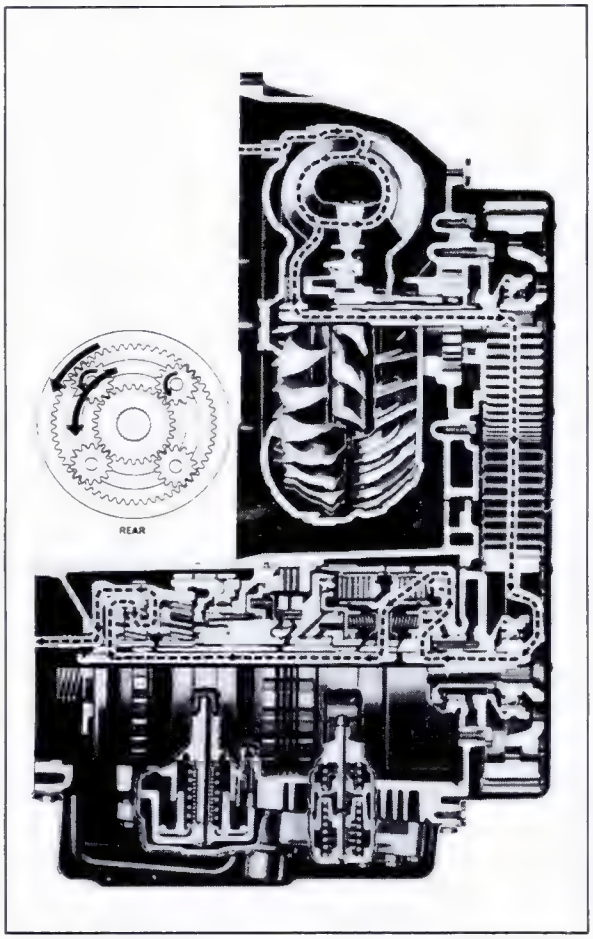


Fig. 7-128 Drive (Left) - Second Gear

OIL FLOW (Fig. 7-129)

As both vehicle speed and governor pressure increase, the force of governor oil acting on the 1-2 shift valve will overcome the force of regulated modulated oil pressure and the 1-2 valve spring. This allows the 1-2 shift valve to open, permitting drive oil to enter the intermediate clutch passage.

Intermediate clutch oil from the 1-2 shift valve is directed to the:

1. Intermediate Clutch
2. Rear Servo Accumulator
3. Front Servo Accumulator
4. 2-3 Shift Valve

Basic Control

Intermediate clutch oil from the 1-2 shift valve seats a one-way check ball and flows through an orifice to the intermediate clutch. At the same time, intermediate clutch oil moves the accumulator piston against the 1-2 accumulator oil and accumulator spring to maintain controlled pressure in the clutch during a 1-2 shift for a smooth clutch apply. Intermediate clutch oil seats a second one-way check ball and flows to the front servo and accumulator pistons. Intermediate clutch oil is also directed to a land of the 2-3 shift valve.

Summary

The forward and intermediate clutches are applied. The transmission is in second speed.

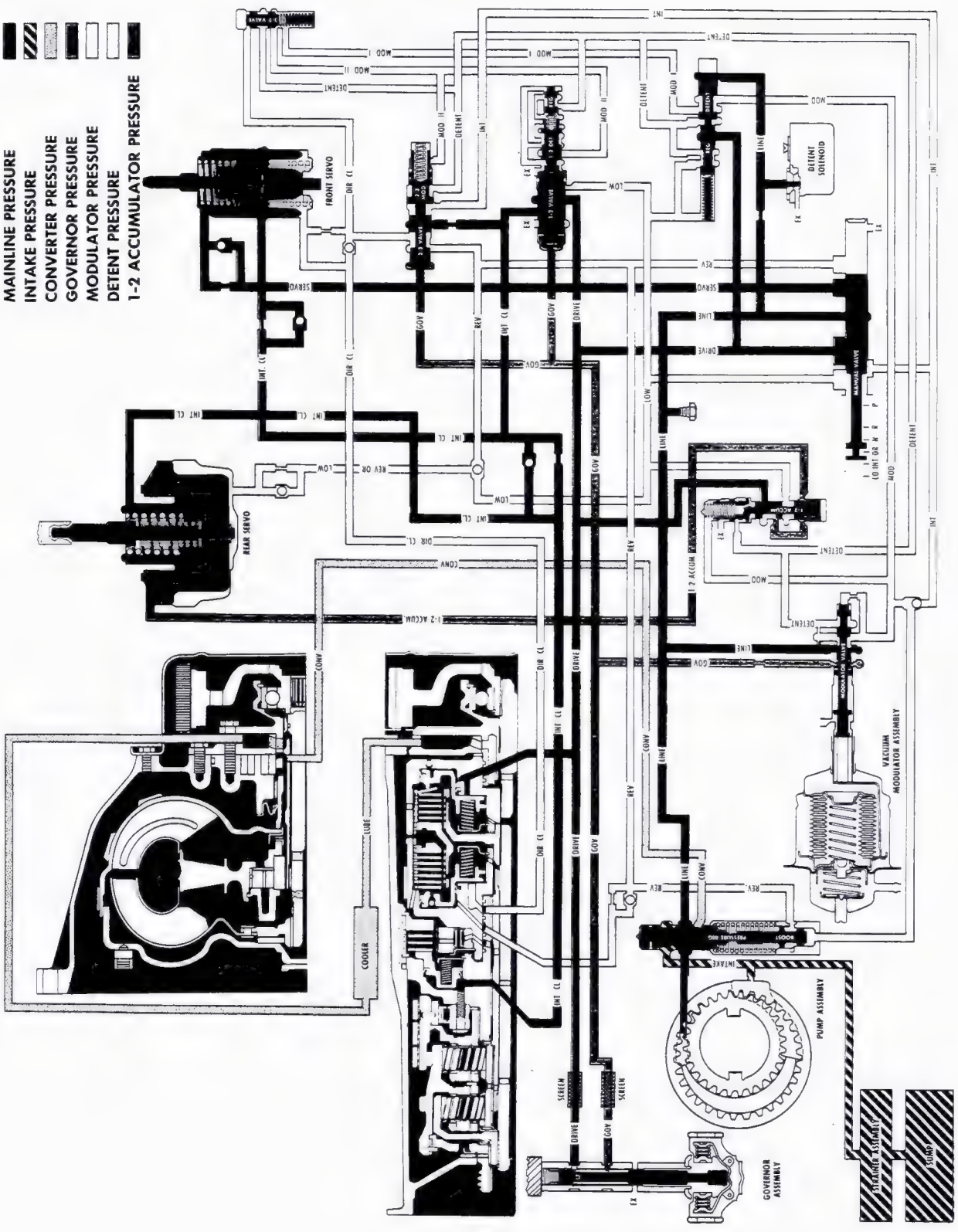


Fig. 7-129 Drive (Left) - Second Gear

DRIVE (LEFT)—THIRD SPEED POWER FLOW (Fig. 7-130)

Forward Clutch - Applied
Roller Clutch - Ineffective
Direct Clutch - Applied
Front Band - Released
Rear Band - Released
Intermediate Clutch - Applied
Intermediate Sprag - Ineffective

In direct drive, engine torque is transmitted from the converter to the drive sprocket, through the link assembly, to the driven sprocket and through the forward clutch to the mainshaft and rear internal gear. Because the direct clutch is applied, equal power is transmitted to sun gear shaft and sun gear. Since both sun gear and internal gears are now turning at the same speed, the planetary gear set is essentially locked and turns as one unit in direct drive or a ratio of 1:1.

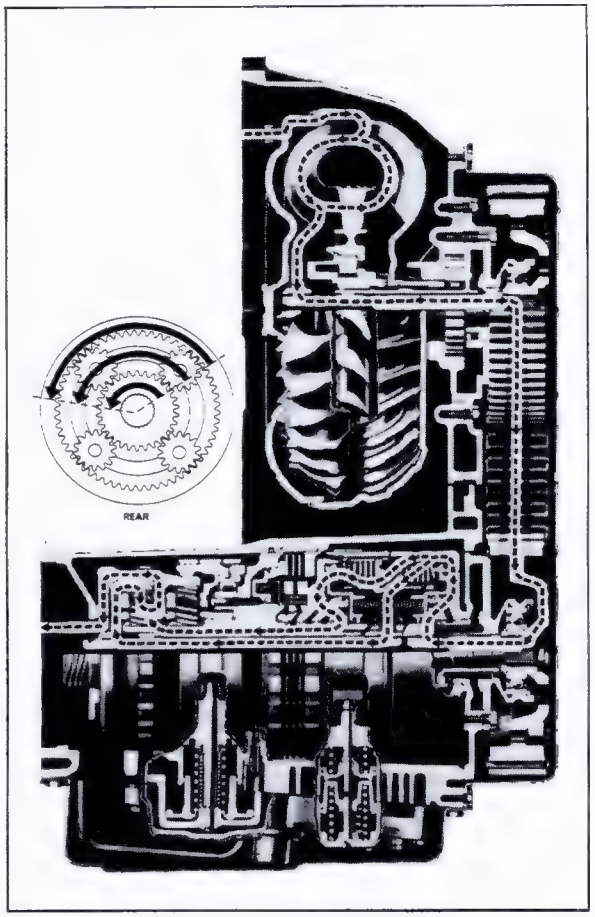


Fig. 7-130 Drive (Left) - Third Gear

OIL FLOW (Fig. 7-131)

As vehicle speed and governor pressure increase, force of governor oil acting on the 2-3 shift valve overcomes the force of 2-3 shift valve spring and modulator oil. This allows the 2-3 shift valve to move, feeding intermediate clutch oil to the direct clutch passage.

Direct clutch oil from the 2-3 shift valve is directed to the:

1. Direct Clutch
2. Front Accumulator Piston
3. 3-2 Valve

Basic Control

Direct clutch oil from the 2-3 shift valve flows past a one-way check valve to the inner area of the direct clutch piston to apply the direct clutch. Simultaneously, direct clutch oil is fed to the front accumulator piston. Pressure of the direct clutch oil, combined with the accumulator spring, moves the accumulator and servo pistons against servo oil. This acts as an accumulator for a smooth direct clutch apply.

Direct clutch oil is also supplied to the 3-2 valve to move the valve against modulator pressure. This cuts off modulator oil to the 1-2 regulator and 2-3 modulator valves and allows the transmission to utilize the torque multiplying characteristics of the converter during medium throttle operation without downshifting.

Summary

The forward, intermediate and direct clutches are applied. The transmission is in third gear (direct drive.)

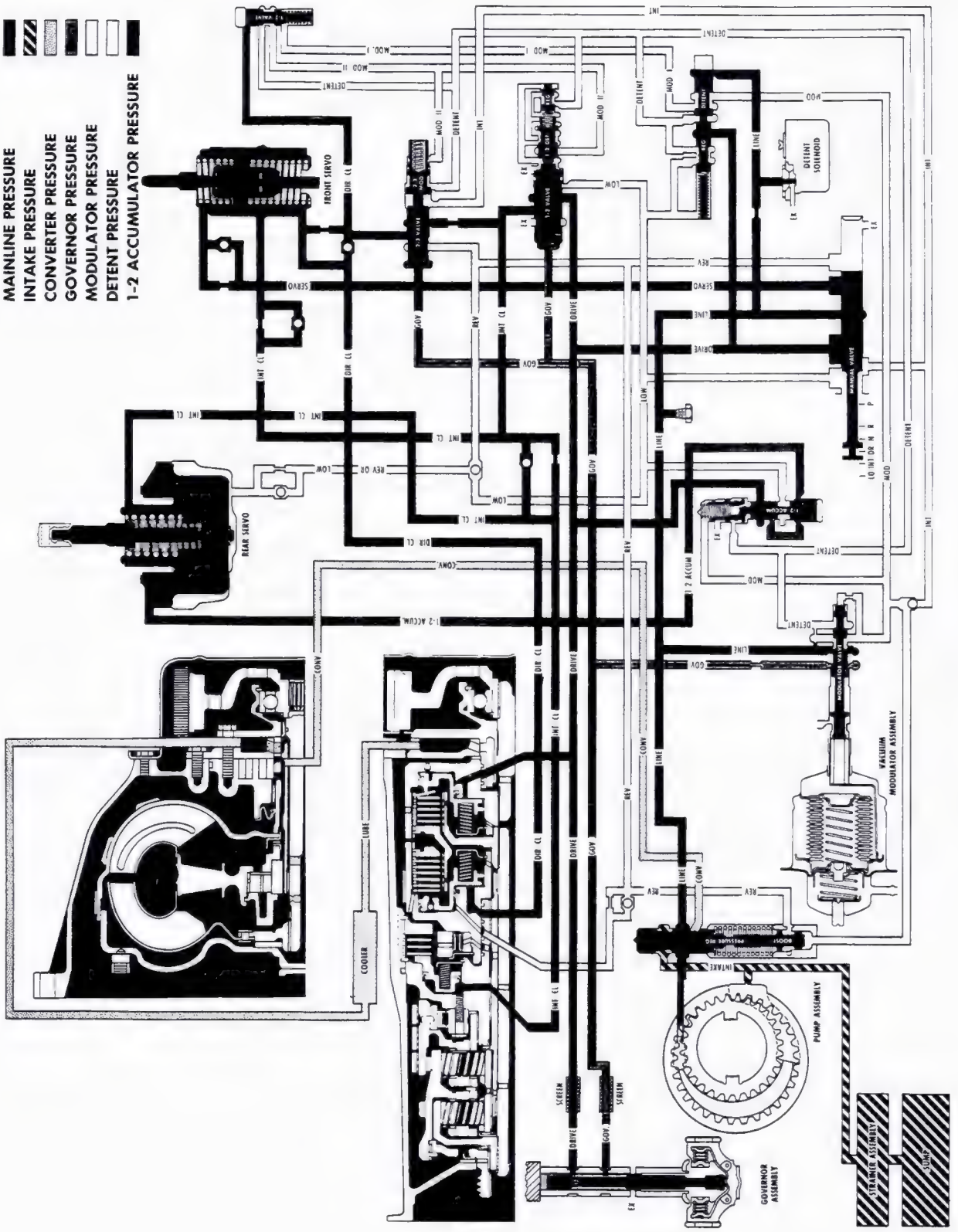


Fig. 7-131 Drive (Left) - Third Gear

PART THROTTLE 3-2 DOWNSHIFT
POWER FLOW

Forward Clutch - Applied
Roller Clutch - Ineffective
Direct Clutch - Released in 2nd
Direct clutch - Applied in 3rd
Front Band - Released
Rear Band - Released
Intermediate Clutch - Applied
Intermediate Sprag - Effective in 2nd
Intermediate Sprag - Ineffective in 3rd

In second speed, Fig. 7-118, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque through the drive sprocket, link assembly and driven sprocket to the forward clutch is now applied through the mainshaft to the rear internal gear in a counterclockwise direction.

Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.48:1.

OIL FLOW (Fig. 7-132)

A part throttle 3-2 downshift can be accomplished below approximately 30 mph by depressing the accelerator far enough to raise modulator pressure to approximately 81 psi. Modulator pressure and the 3-2 valve spring will move the 3-2 valve against direct clutch oil and allow modulator oil to act on the 2-3 modulator valve, moving it against the 2-3 shift valve and governor oil. Shifting the transmission to second speed, as the direct clutch oil passages are open to exhaust through lo-oil passages.

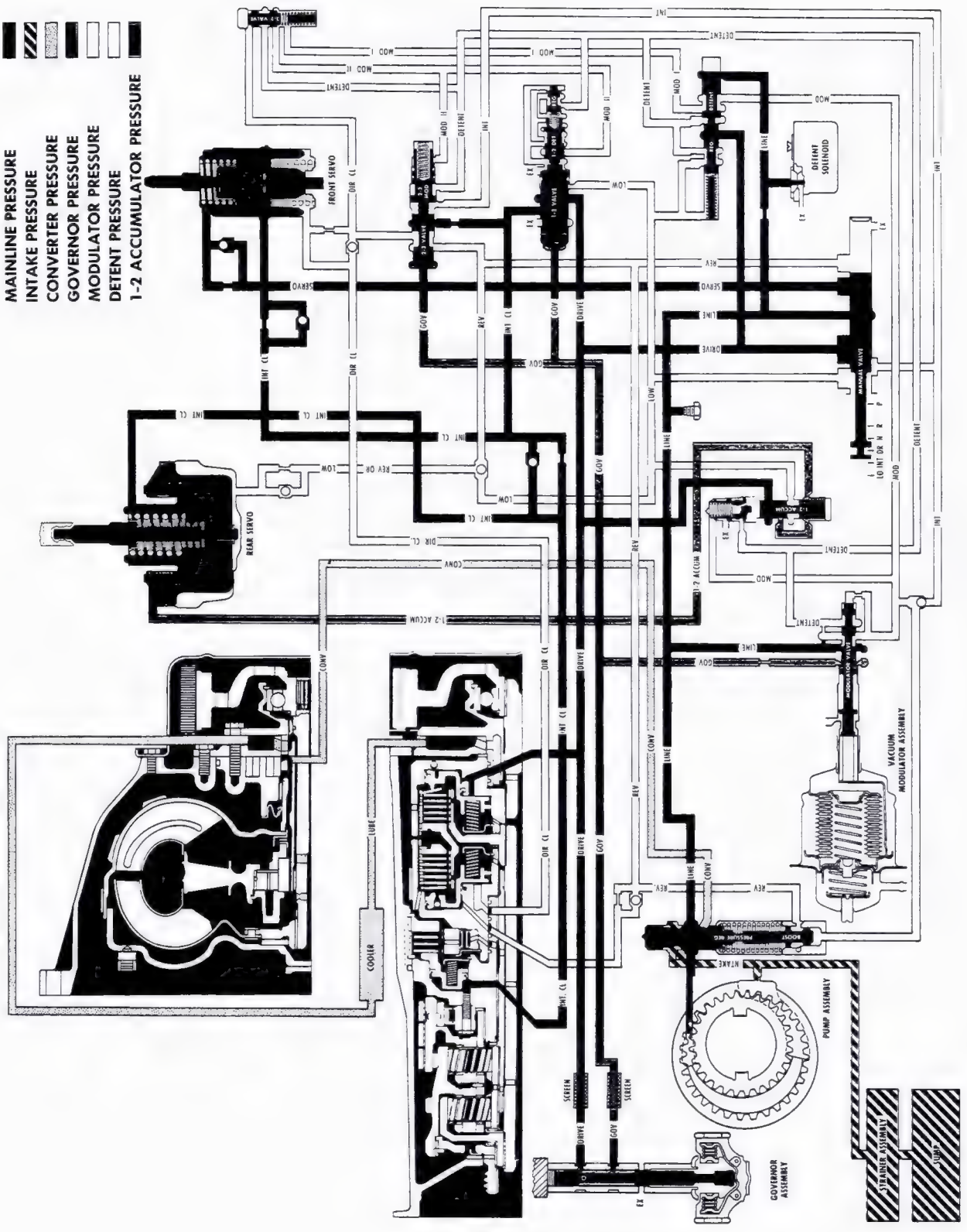


Fig. 7-132 Part Throttle - 3-2 Downshift

OIL FLOW (Fig. 7-133)

While operating at speeds below approximately 70 mph a forced or detent 3-2 downshift is possible by depressing the accelerator to 60° throttle opening. This energizes the switch at the carburetor and actuates the detent solenoid. The detent solenoid opens an orifice that allows line oil at the detent valve to be exhausted, thus permitting the detent regulator valve to operate. Line oil acting on the detent valve and solenoid is supplied by a small orifice.

Drive oil on the detent regulator valve is then regulated to a pressure of approximately 70 psi and called detent oil. Detent oil is then routed to the:

1. Modulator passages
   a. 3-2 Valve
   b. 2-3 Modulator Valve
   c. 1-2 Detent Valve
2. Detent Passages
   a. 1-2 Regulator Valve
   b. 2-3 Modulator Valve
   c. 1-2 Primary Accumulator Valve
   d. Modulator Valve

Detent oil in the modulator passage and at the 2-3 modulator valve will close the 2-3 shift valve, shifting the transmission to second gear.

DETENT 2-1 DOWNSHIFT

A detent 2-1 downshift can also be accomplished below approximately 25 mph because detent oil is directed to the 1-2 regulator valve. This allows detent oil to act on the 1-2 regulator, and 1-2 detent valve to close the 1-2 shift valve, shifting the transmission to first gear.

Detent oil is also directed to the modulator valve to prevent modulator pressure from regulating below 70 psi at high speeds or at high altitudes.

DETENT 3-2 DOWNSHIFT
POWER FLOW

Forward Clutch - Applied
Roller Clutch - Ineffective
Direct Clutch - Released in 2nd
Direct Clutch - Applied in 3rd
Front Band - Released
Rear Band - Released
Intermediate Clutch - Applied
Intermediate Sprag - Effective in 2nd
Intermediate Sprag - Ineffective in 3rd

In second speed, Fig. 7-118, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque through the drive sprocket, link assembly and driven sprocket to the forward clutch is now applied through the mainshaft to the rear internal gear in a counterclockwise direction.

Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.48:1.

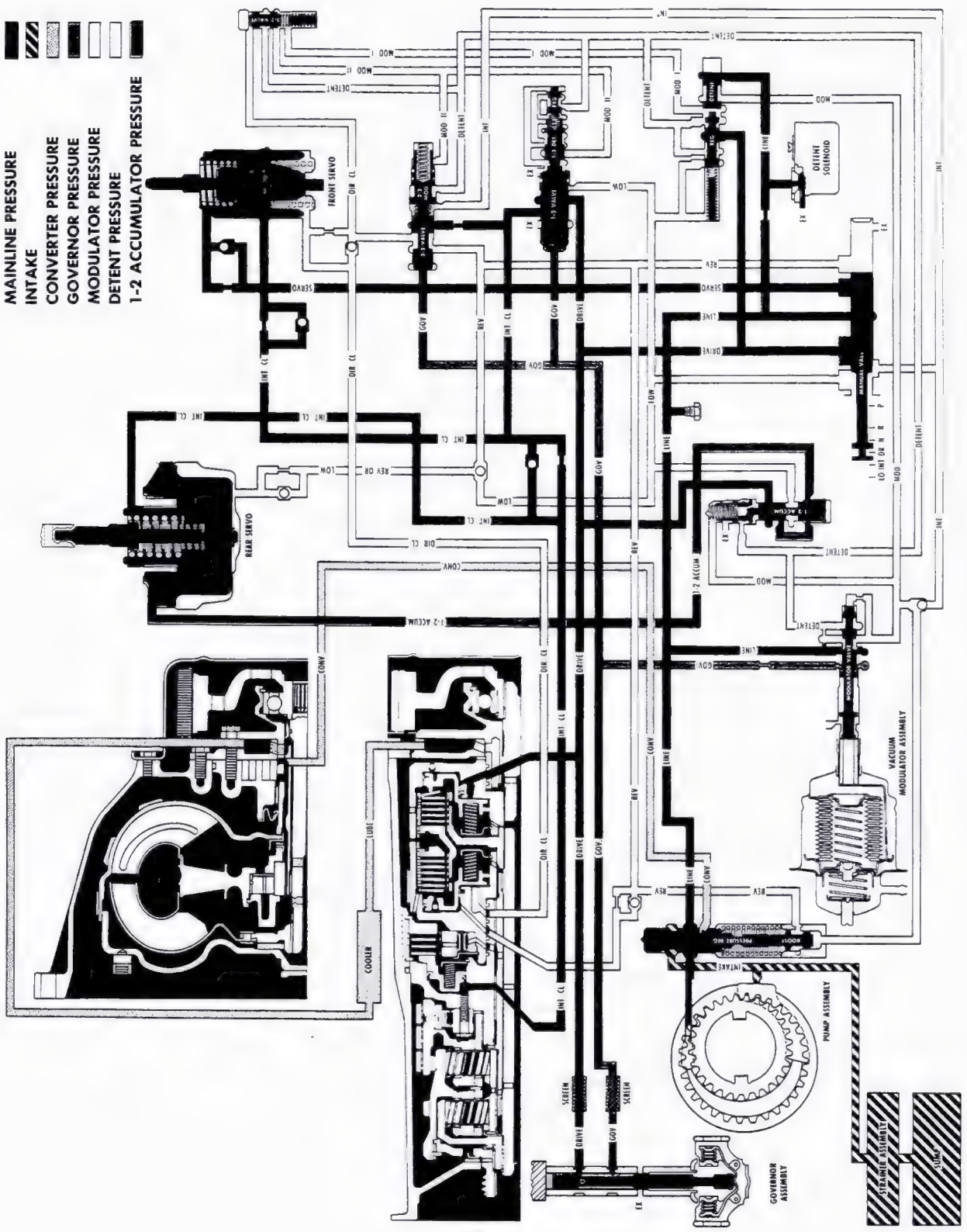


Fig. 7-133 Detent 3-2 Downshift

DRIVE (RIGHT)—SECOND SPEED POWER FLOW (Fig. 7-134)

Forward Clutch - Applied
Roller Clutch - Ineffective
Direct Clutch - Released
Front Band - Applied
Rear Band - Released
Intermediate Clutch - Applied
Intermediate Sprag - Effective

In second speed, the intermediate clutch is applied to allow the intermediate sprag to hold the sun gear against clockwise rotation. Turbine torque through the drive sprocket, link assembly and driven sprocket to the forward clutch is now applied through the mainshaft to the rear internal gear in a counterclockwise direction.

Counterclockwise rotation of the rear internal gear turns the rear pinions counterclockwise against the stationary sun gear. This causes the output carrier and output flange to turn counterclockwise in a reduction ratio of approximately 1.48:1.

In second speed - Drive (right), engine braking is provided by the front band as it holds the sun gear fixed. Without the band applied, the sun gear would overrun the intermediate sprag.

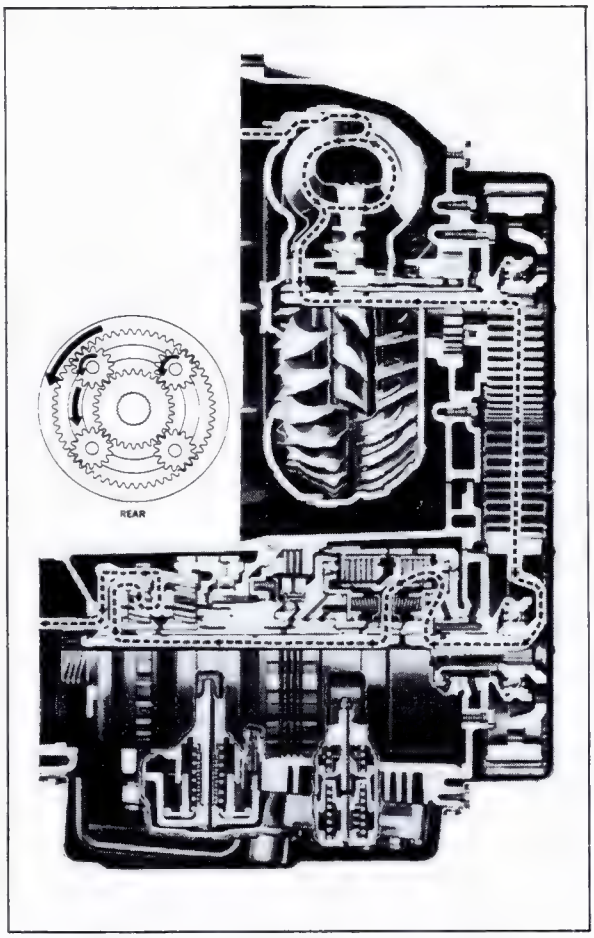


Fig. 7-134 Drive (Right) - Second Gear

OIL FLOW (Fig. 7-135)

When the selector lever is in Drive (right), intermediate oil from the manual valve is directed to the:

1. Pressure Boost Valve
2. 2-3 Shift Valve

Intermediate oil at the boost valve will increase line pressure to 150 psi. This increased intermediate oil pressure at the 2-3 shift valve will close the 2-3 shift valve, regardless of car speed.

For engine braking the front band is applied by exhausting servo oil at the manual valve. This allows intermediate clutch oil, acting on the servo piston, to move the piston and apply the front band. Once the transmission is in second speed - Drive (right), it cannot upshift to third gear.

Summary

The forward and intermediate clutches and front band are applied. The transmission is in second gear - Drive (right).

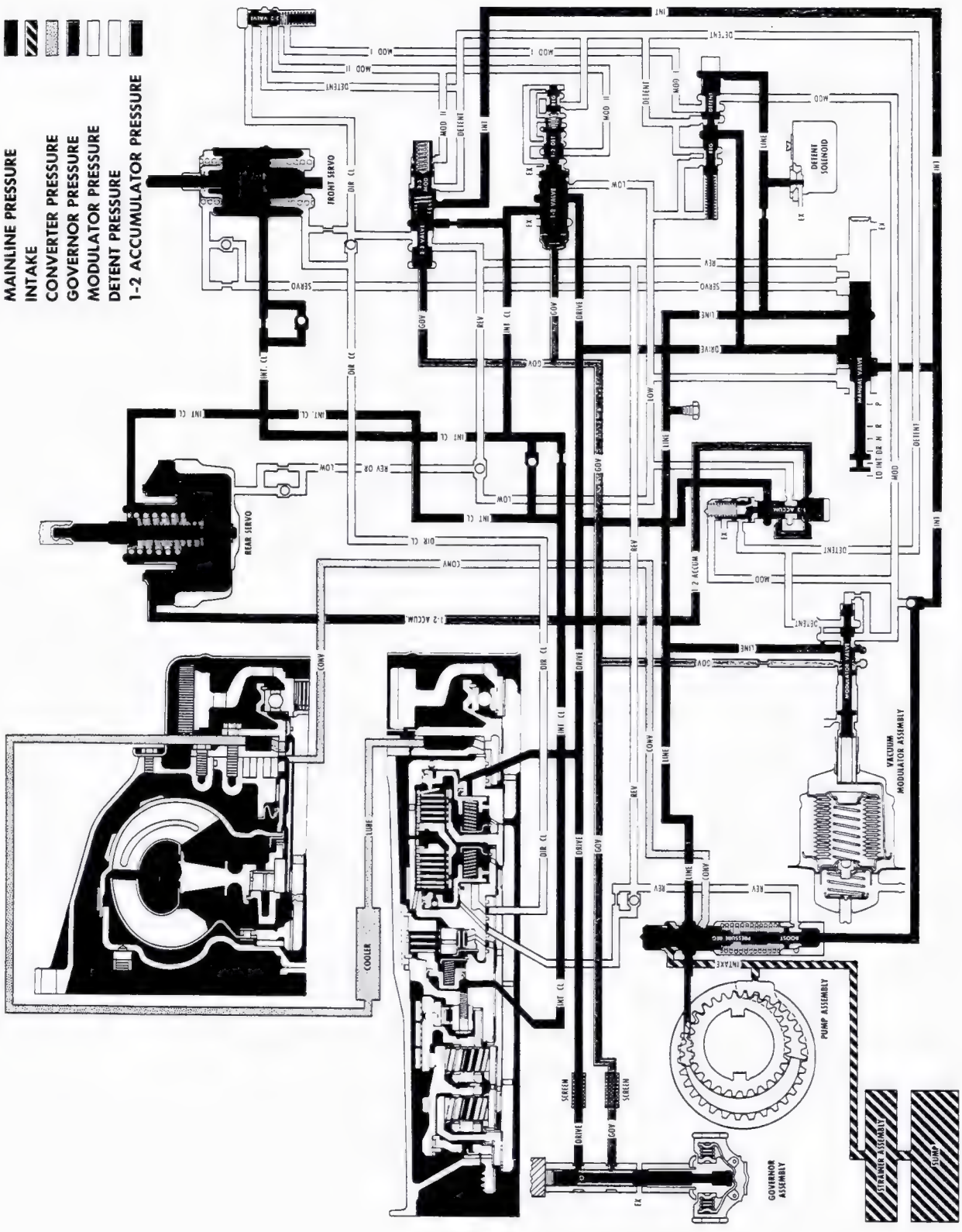


Fig. 7-135 Drive (Right) - Second Gear

LO RANGE—FIRST SPEED POWER FLOW (Fig. 7-136)

Forward Clutch - Applied
Roller Clutch - Effective
Direct Clutch - Released
Front Band - Released
Rear Band - Applied
Intermediate Clutch - Released
Intermediate Sprag - Ineffective

With the selector lever in Lo range, the forward clutch is applied. This delivers turbine torque, through the drive sprocket, link assembly and driven sprocket, to the mainshaft and turns the rear internal gear in a counterclockwise direction. (Converter torque ratio = approximately 2.00:1 at stall.)

Counterclockwise motion of the rear internal gear causes the rear pinions to turn counterclockwise to drive the sun gear clockwise. In turn, the sun gear drives the front pinions counterclockwise, thus turning the front internal gear, output carrier, and output flange counterclockwise in a reduction ratio of approximately 2.48:1. The reaction of the front pinions against the front internal gear is taken by the reaction carrier and roller clutch assembly to the transmission case. (Total stall ratio = approximately 5.00:1.)

Downhill or overrun braking is provided in Lo range by applying the rear band, as this prevents the reaction carrier from overrunning the Lo roller clutch.

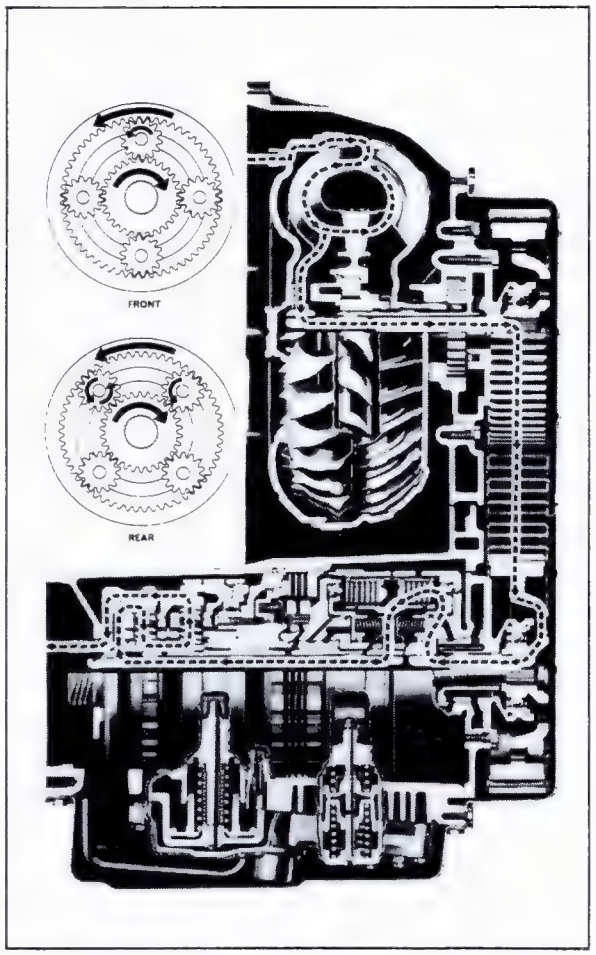


Fig. 7-136 Lo Range - First Gear

OIL FLOW (Fig. 7-137)

Maximum downhill braking can be attained at speeds below approximately 45 mph, with the selector lever in Lo position as this directs Lo oil from the manual valve to the:

1. Rear Servo
2. 1-2 Accumulator Valve
3. Detent Regulator Valve
4. 1-2 Shift Valve

Basic Control

Lo oil flows past a ball check to the apply side of the rear servo piston and to the 1-2 accumulator valve to raise the 1-2 accumulator oil to line pressure for a smooth band apply.

Lo oil acts on the detent regulator valve. Combined with the detent spring, Lo oil holds the detent valve against line oil acting on the detent valve, causing drive oil to flow through the detent regulator valve into the detent and modulator passages. Modulator and detent oil at line pressure acting on the 1-2 regulator and 1-2 detent valve overcomes governor oil and Lo oil on the 1-2 shift valve at any vehicle speed below approximately 40 mph, and the transmission will shift to first gear. Lo oil acts on a small area of the 1-2 shift valve to prevent the 2-1 shift occuring at too high a vehicle speed.

In first speed - Lo range, the transmission cannot upshift to second speed regardless of vehicle or engine speed.

Summary

The forward clutch and rear band are applied. The transmission is in first speed - Lo range.

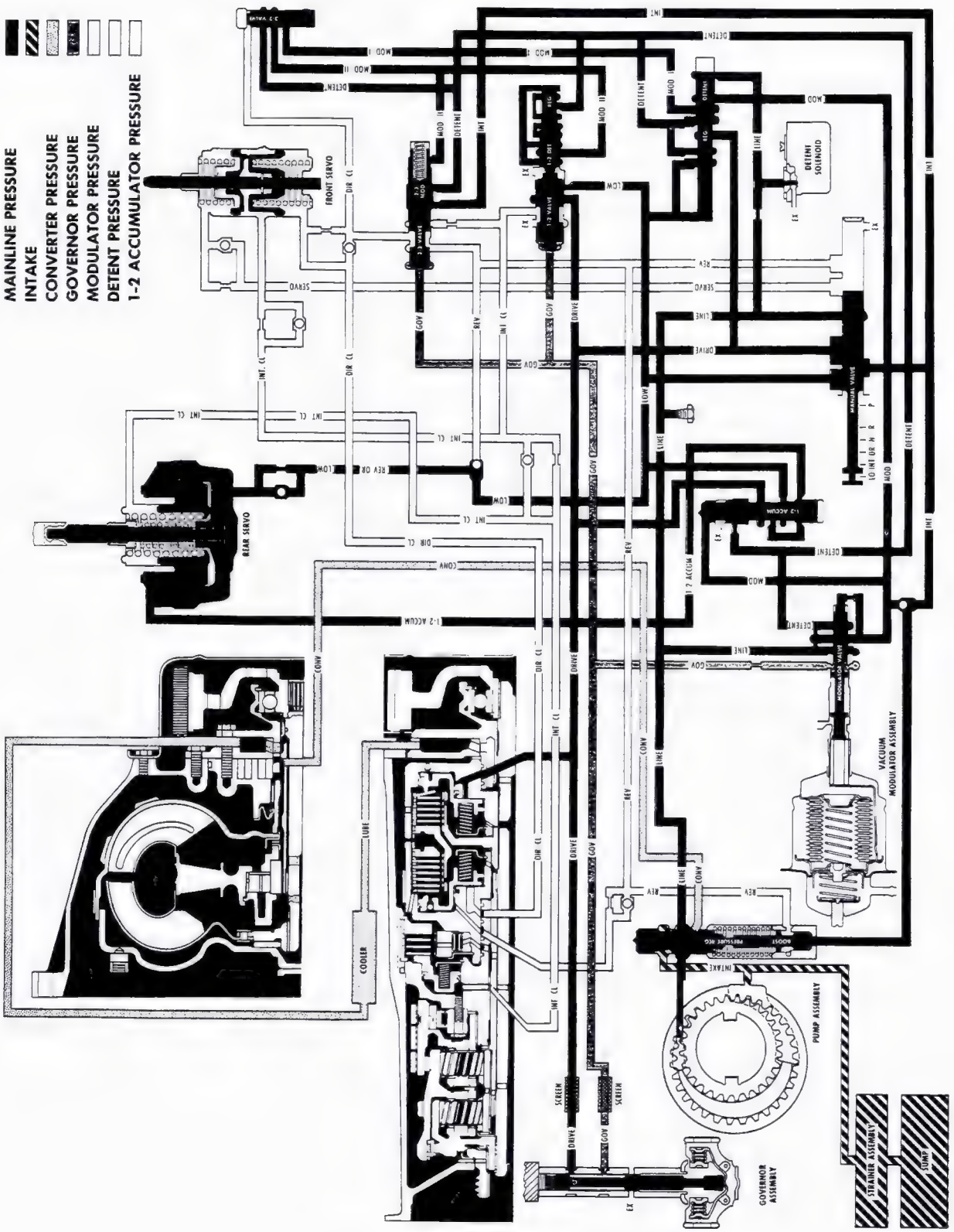


Fig. 7-137 Lo Range - First Gear

REVERSE
POWER FLOW (Fig. 7-138)

Forward Clutch - Released
Roller Clutch - Ineffective
Direct Clutch - Applied
Front Band - Released
Rear Band - Applied
Intermediate Clutch - Released
Intermediate Sprag - Ineffective

In Reverse, the direct clutch is applied to direct turbine torque through the drive sprocket, link assembly and driven sprocket to the sun gear shaft and sun gear. The rear band is applied, holding the reaction carrier.

Counterclockwise torque to the sun gear causes the front pinions and front internal gear to turn clockwise in reduction. The front internal gear is connected directly to the output flange, thus providing the reverse output gear ratio of approximately 2.08:1. The reverse torque multiplication at stall (converter and gear ratios) is approximately 4.00:1.

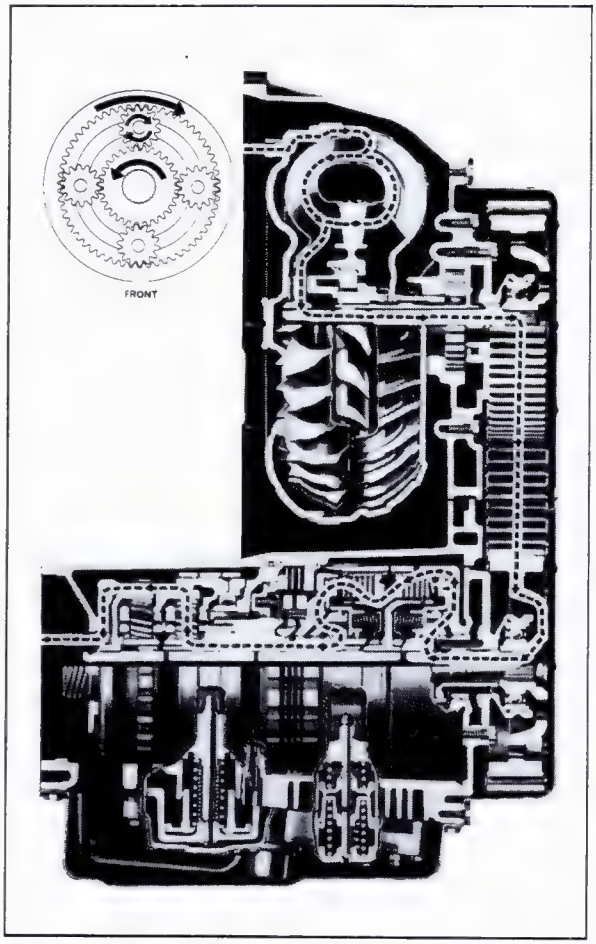


Fig. 7-138 Reverse

OIL FLOW (Fig. 7-139)

When the selector lever is moved to the Reverse position, the manual valve is positioned to allow line pressure to enter the reverse circuit. Reverse oil then flows to the:

1. Direct Clutch
2. 2-3 Shift Valve
3. Rear Servo Piston
4. Pressure Boost Valve

Basic Control

Reverse oil from the manual valve flows to the large area of the direct clutch piston and to the 2-3 shift valve. From the 2-3 shift valve, it enters the direct clutch passage and is directed to the small area of the direct clutch piston to apply direct clutch.

Reverse oil flows to the rear servo and acts on the servo piston to apply the rear band. Reverse oil also acts on the pressure boost valve to boost line pressure.

Summary

The direct clutch and the rear band are applied. The transmission is in Reverse.

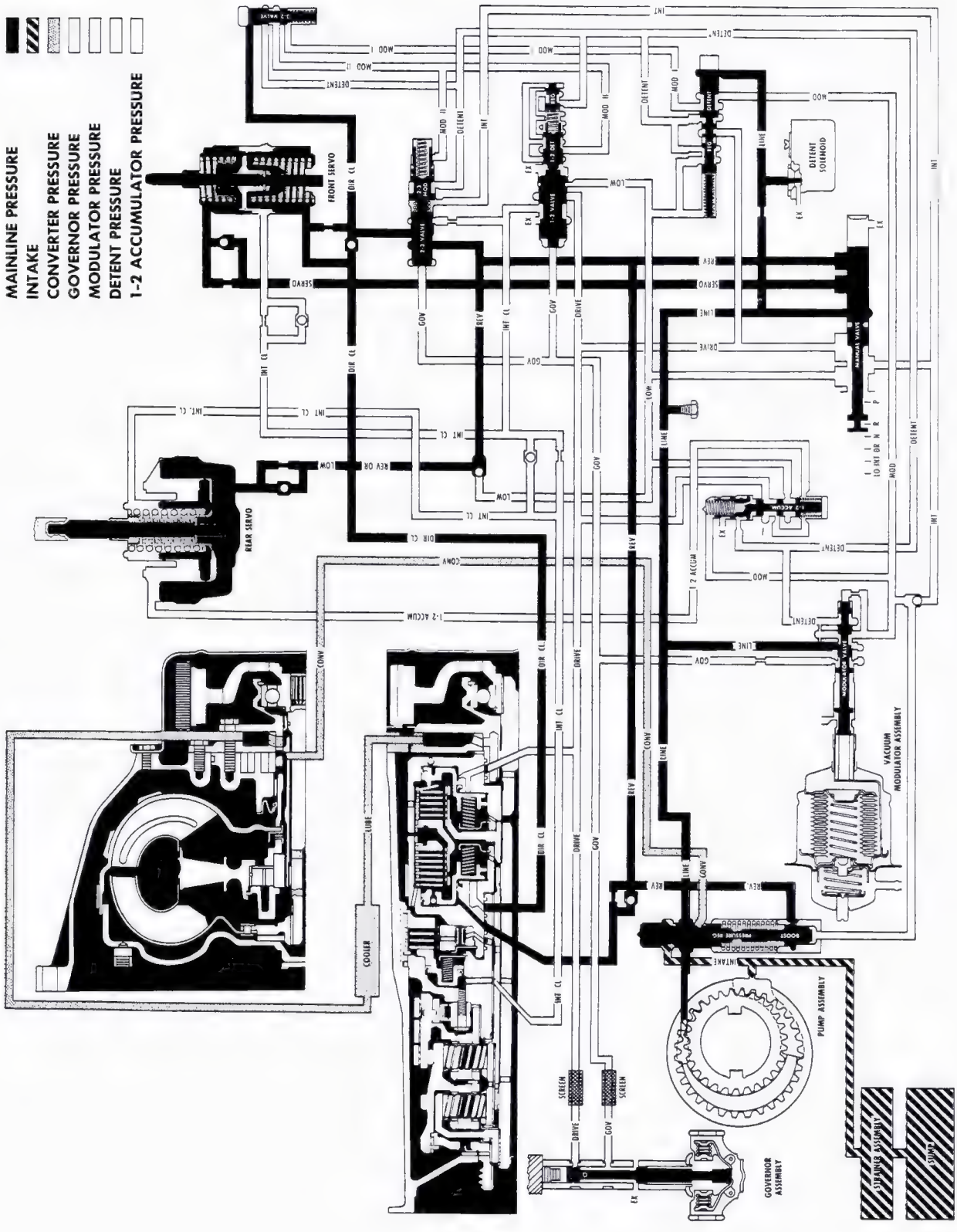
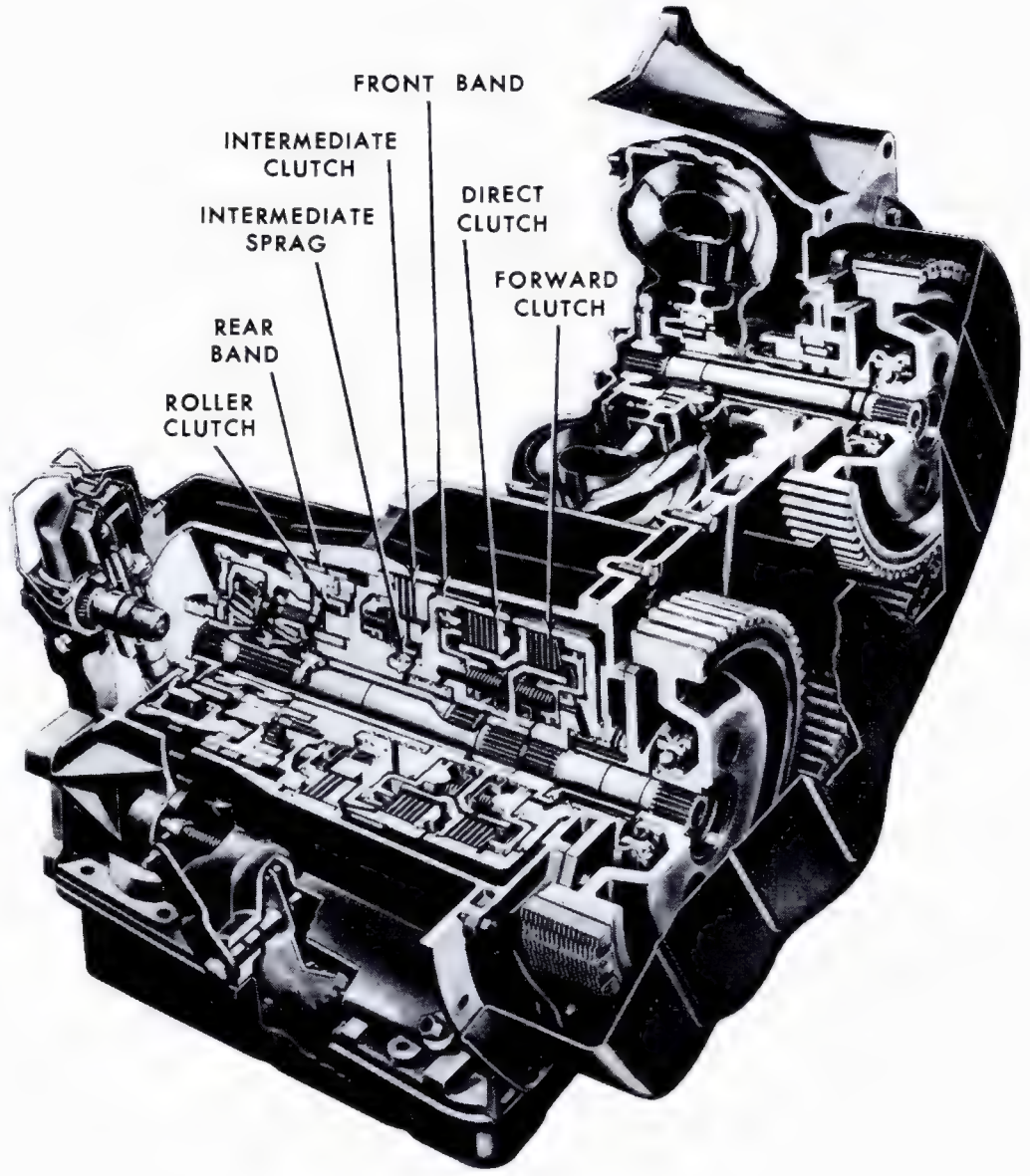


Fig. 7-139 Reverse



SELECTOR POSITION	PUMP PRESSURE	FORWARD CLUTCH	DIRECT CLUTCH	FRONT BAND	INT. CLUTCH	INT. SPRAG	ROLLER CLUTCH	REAR BAND
PARK–NEUT.	60-150	OFF	OFF	OFF	OFF	OFF	OFF	OFF
DRIVE 1 LEFT 2 3	60-150 60-150 60-150	ON ON ON	OFF OFF ON	OFF OFF OFF	OFF ON ON	OFF ON OFF	ON OFF OFF	OFF OFF OFF
DRIVE 1 RIGHT 2	150 150	ON ON	OFF OFF	OFF ON	OFF ON	OFF ON	ON OFF	OFF OFF
LO 1 2	150 150	ON ON	OFF OFF	OFF ON	OFF ON	OFF ON	ON OFF	ON OFF
REV.	95 - 230	OFF	ON	OFF	OFF	OFF	OFF	ON

Fig. 7-140 Band, Sprag and Clutch Application Chart

SERVICE INFORMATION

NOTE: The following information is applicable to the Fleetwood Eldorado only. Where service procedures are similar to the Turbo Hydra-matic transmission used on other 1969 Cadillac models, reference will be made to the appropriate note in the forward part of this section.

CAUTION: In the event of a major transmission failure, replace strainer assembly, converter assembly and flush oil cooler and oil cooler lines.

It is particularly important in the case of a converter failure to perform these service procedures.

19. Turbo Hydra-matic Diagnosis

The diagnosis procedures for the Turbo Hydra-matic transmission used on the Fleetwood Eldorado are identical to the procedures given in Note 1, with the following exceptions:

1. Figures 7-141 through 7-145 are to be used in place of Figures 7-24, 7-26 and 7-27 when diagnosing a Fleetwood Eldorado Turbo Hydra-matic transmission.

2. Transmission Noise - Sprocket and Link Assembly.

a. Link assembly too long. Sounds similar to pop corn popping. (There will be a rough burr along the teeth of the drive sprocket if the link assembly is too long). Replace sprocket and link assembly.

b. Drive or Driven sprocket teeth damaged.

c. Engine mounts worn or damaged.

d. Rubber-fiber glass insulator is used to suppress chain noise and must fit snugly.

e. Model AJ Clutch Parts

Clutch	No. of Flat Steel Clutch Plates	No. of Waved Steel Clutch Plates
Forward Clutch	5	*1
Direct Clutch	5	1
Intermediate Clutch	3	--

*Plate Clutch Dished

Clutch	No. of Clutch Composition Plates	No. of Piston Release Plates
Forward Clutch	5	16
Direct Clutch	6	16
Intermediate Clutch	3	12

20. Fluid Leakage Precautions

The fluid leakage precautions are listed in Note 2.

21. Points of Possible Oil Leaks

When checking for oil leaks, first determine whether leak originates from transmission or engine. The original factory fill fluid in the transmission is formulated with a red aniline dye to assist in locating leaks. If the color of the dye cannot be detected in the transmission fluid, the fluid should be changed. Red dye appearing in the leaking oil will give positive identification as to the location of the leak.

If oil leak is found to be in transmission, check for leak in following areas:

a. Rear End

It will be necessary to remove converter cover to determine location of leaks at rear end. To correct leaks at rear end, it will be necessary to remove transmission from car.

1. Pump oil seal leak - Check pump oil seal to make certain it is correctly installed and not damaged.

When installing a new pump oil seal, make certain that bore is free from foreign material and that garter spring on seal is correctly positioned. Check finish of converter neck and bearing surface in pump body.

2. Pump assembly-to-case O-ring damaged.

3. Converter - Inspect converter for indications of leakage. See Note 15 for checking procedure.

4. Vent fitting damaged.

b. Cover and Plate Assembly Sprocket Housing Leak

1. Attaching bolts not correctly torqued.

2. Housing to case gasket improperly installed or damaged.

3. Housing to case gasket face not flat.

c. Final Drive to Transmission Leak

1. Attaching bolts not correctly torqued.

2. Final drive to transmission gasket improperly installed or damaged.

3. Mounting surfaces not flat.

d. Transmission Case

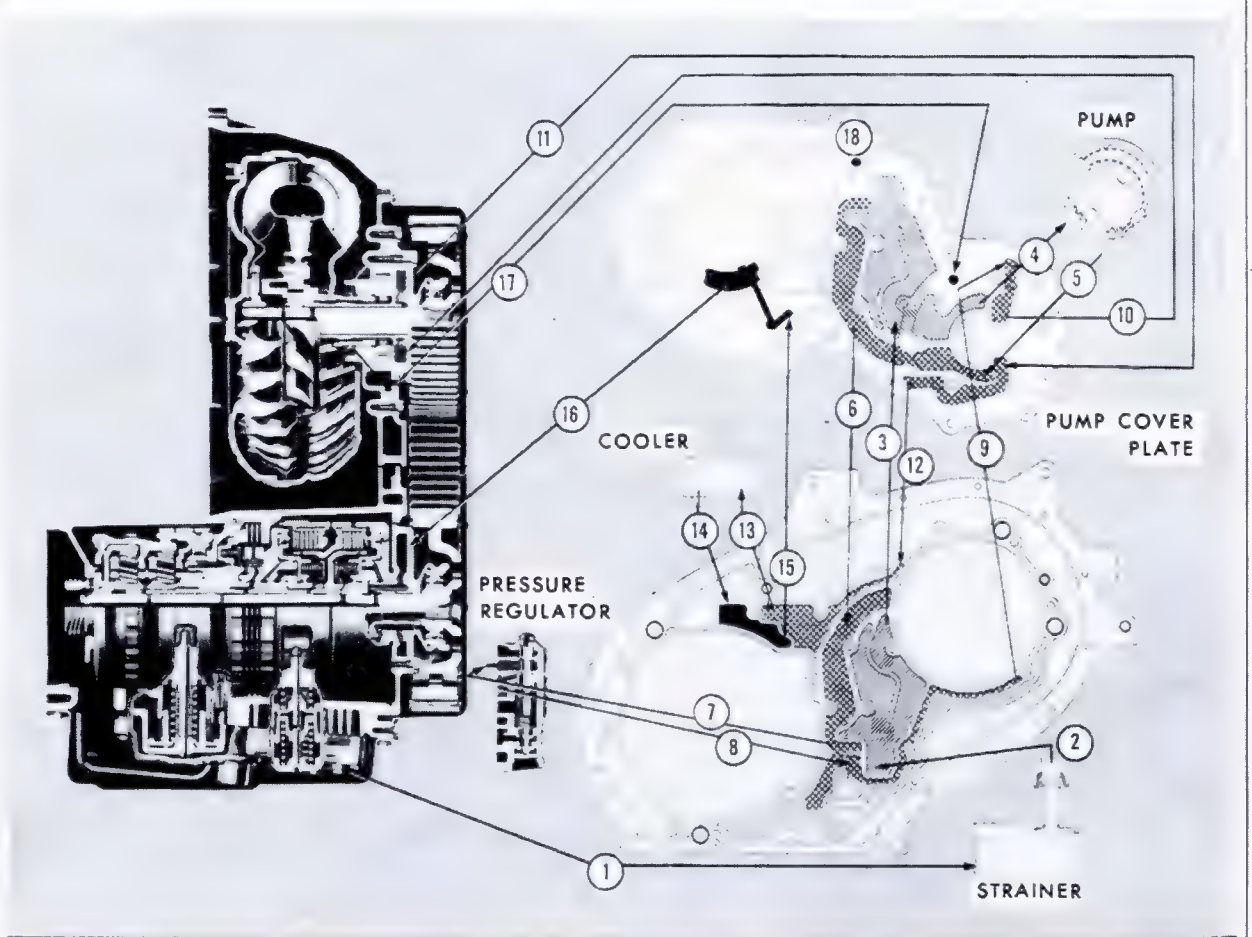
1. Speedometer driven gear housing retainer attaching screw loose. Tighten to 18 foot-pounds.

2. Speedometer driven gear housing O-ring or lip seal damaged.

3. Governor cover bale-type attaching retainer not tight.

4. Damaged governor O-ring.

5. Solenoid connector terminal O-ring damaged.



1 OIL FROM SUMP TO STRAINER
2 STRAINER TO CASE PASSAGE
3 CASE PASSAGE TO PUMP COVER PLATE PASSAGE
4 PUMP COVER PLATE PASSAGE TO PUMP
5 PUMP TO PUMP COVER PLATE PASSAGE
6 PUMP COVER PLATE PASSAGE TO CASE PASSAGE
7 CASE PASSAGE TO PRESSURE REGULATOR VALVE
8 PRESSURE REGULATOR VALVE TO CASE PASSAGE
9 CASE PASSAGE TO PUMP COVER PLATE PASSAGE
10 PUMP COVER PLATE PASSAGE TO CONVERTER
11 CONVERTER TO PUMP COVER PLATE PASSAGE
12 PUMP COVER PLATE PASSAGE TO CASE PASSAGE
13 CASE PASSAGE TO COOLER
14 COOLER RETURN TO CASE PASSAGE
15 CASE PASSAGE TO PUMP COVER PLATE PASSAGE
16 PUMP COVER PLATE PASSAGE TO TRANSMISSION POWER TRAIN (ALL INTERNAL LUBRICATION)
NOTE: THE NUMBERS IN THE CROSS SECTION INDICATE THAT THERE ARE ADDITIONAL LUBRICATION HOLES IN THIS AREA THAT ARE NOT SHOWN IN THE CROSS SECTION.
17 FRONT SEAL DRAIN BACK HOLE
18 PRESSURE REGULATOR VENT HOLE

Fig. 7-141 Lubrication Chart

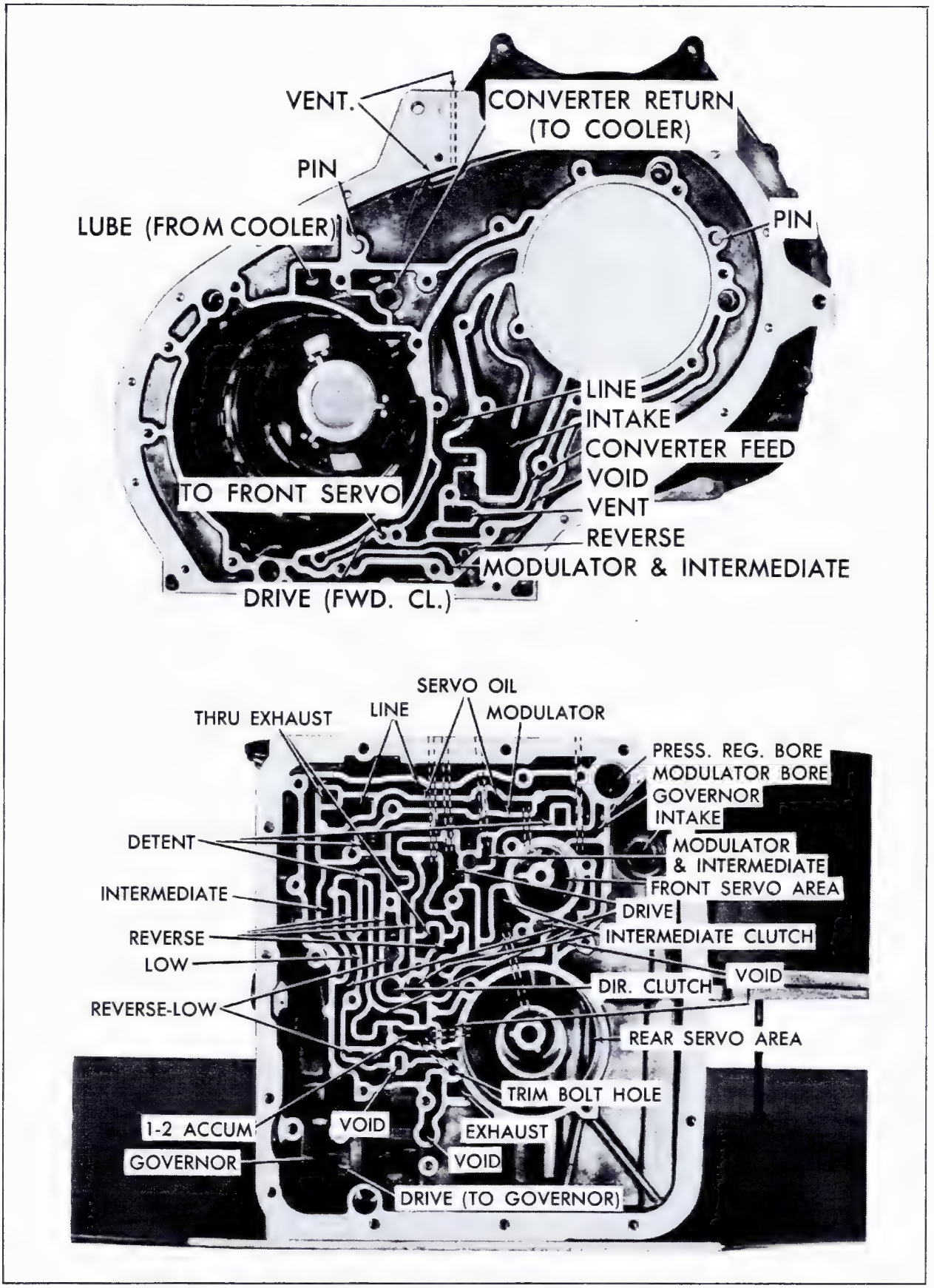


Fig. 7-142 Case Oil Passages - Front View and Bottom View

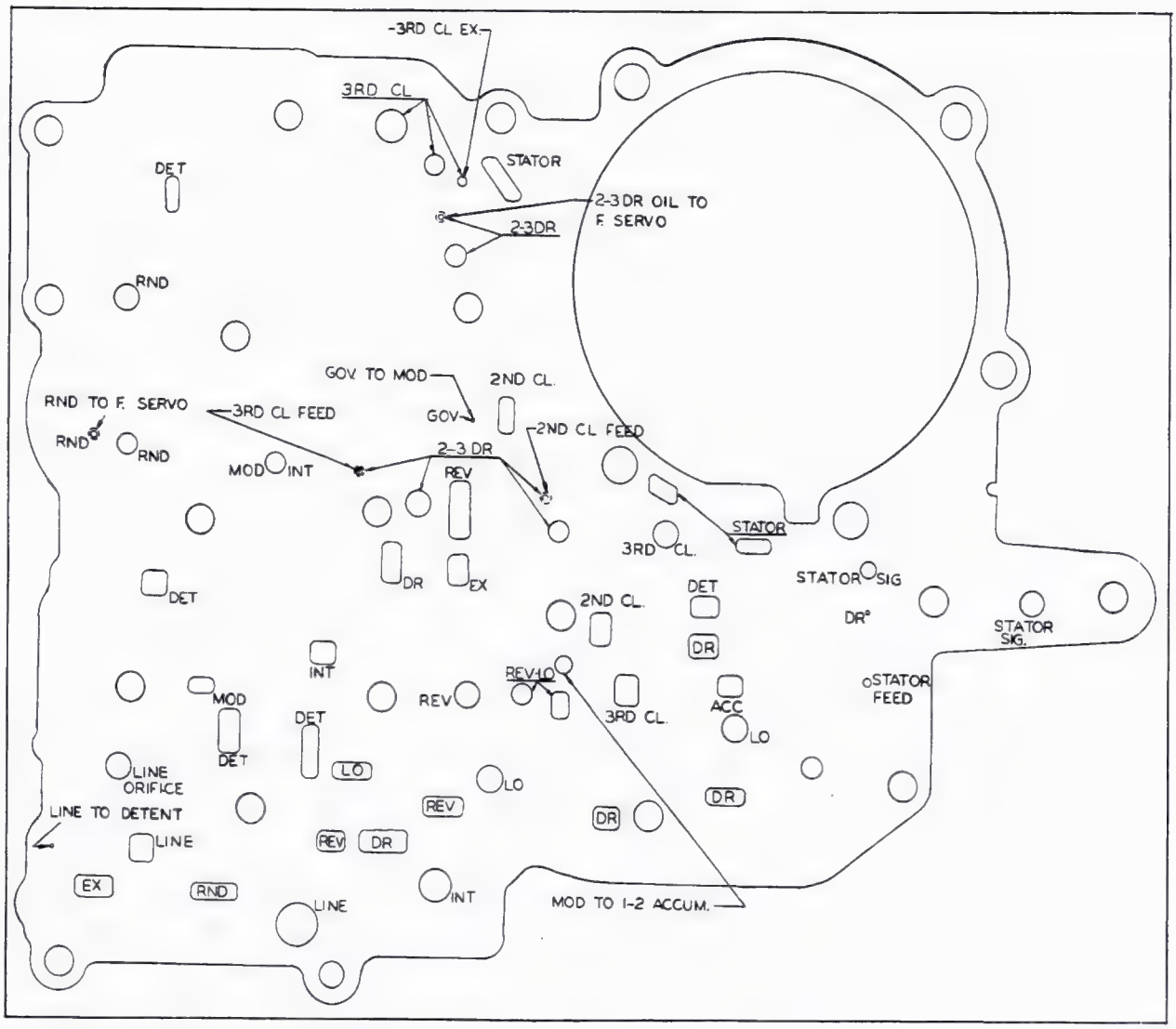


Fig. 7-143 Spacer for Control Valve Assembly

6. Manual shaft O-ring damaged.
7. Vacuum modulator damaged.
8. Vacuum modulator retainer screw loose. Tighten to 18 foot-pounds.
9. Vacuum modulator diaphragm damaged. Check as described in Note 1f.

NOTE: A ruptured diaphragm would allow transmission oil to be drawn into intake manifold and vacuum line. Usually the exhaust will be excessively smoky due to transmission oil added to the combustion. Oil level of transmission will also be low.

10. Bottom pan gasket damaged.
11. Bottom pan attaching screws loose. Tighten to 12 foot-pounds.
12. Line pressure plug not tight. Tighten to 10 foot-pounds.
13. Porous or cracked casting.
14. Vent pipe
a. Transmission over-filled.
b. Water in oil.
c. Pump to case gasket mispositioned.
d. Foreign material between pump and case, or between pump cover and body.
e. Case - Porous, pump face improperly machined.
f. Pump - Shy of stock, porous.

e. Oil Cooler Pipe Connections

1. Outside oil cooler pipe connections improperly installed or damaged. Also connectors in radiator and transmission.
2. Oil cooler pipe connections not tight. Tighten to 28 foot-pounds at transmission and 40 foot-pounds at radiator.
3. Flare on oil cooler pipes damaged at radiator or transmision.

f. Filler Pipe

1. O-ring damaged or improperly installed on pipe.
2. Filler pipe not fully seated in case.

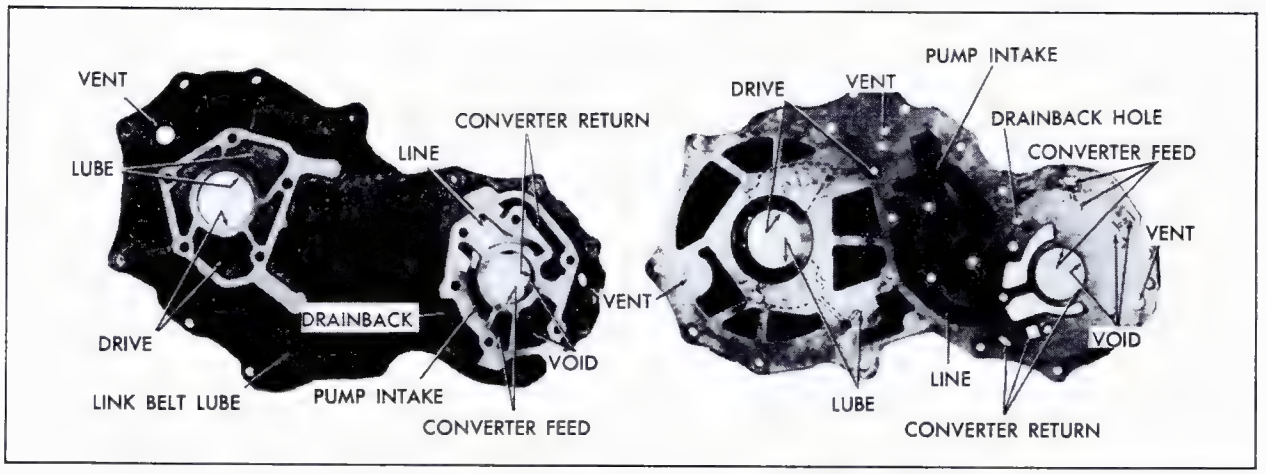


Fig. 7-144 Pump Cover Oil Passages

g. Internal Leaks

It will be necessary to remove bottom pan to determine location of internal leaks.

1. Governor pipes damaged.
2. Control valve assembly-to-spacer or case gaskets damaged.
3. Control valve assembly attaching screws loose. Tighten to 8 foot-pounds.
4. Solenoid gaskets damaged.
5. Solenoid attaching screws loose. Tighten to 8 foot-pounds.
6. Intake pipe O-ring damaged.
7. Rear servo square cut O-ring improperly installed or damaged.

22. Manual Linkage Adjustment (Fig. 7-146)

1. Loosen adjusting screw on relay bracket.
2. Pull relay rod up to position transmission shift valve in Park, then push rod down to the third (Neutral) step. Make sure rod is centered in this detent position.

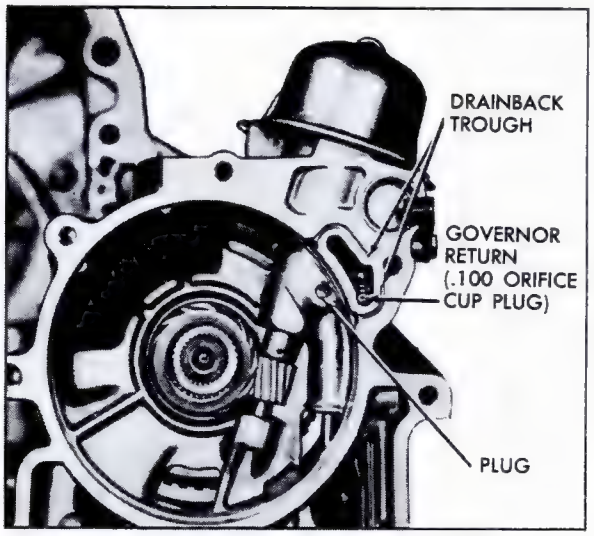


Fig. 7-145 Governor Oil Passages

3. Position selector lever in Neutral detent in steering column.
4. Tighten relay rod adjusting screw, making sure shift lever is held against Neutral stop while this operation is being performed.
5. Check operation of selector lever by performing the following steps:

a. Lift lever and move to Neutral detent. (This is the detent in the transmission.) Release the lever and check to make sure that the lever fits into the neutral notch in the steering column.

b. Move lever to Drive detent. There should be a slight travel of the lever beyond this detent until the drive stop in the steering column is reached.

c. Move lever to Reverse detent and check as in b above.

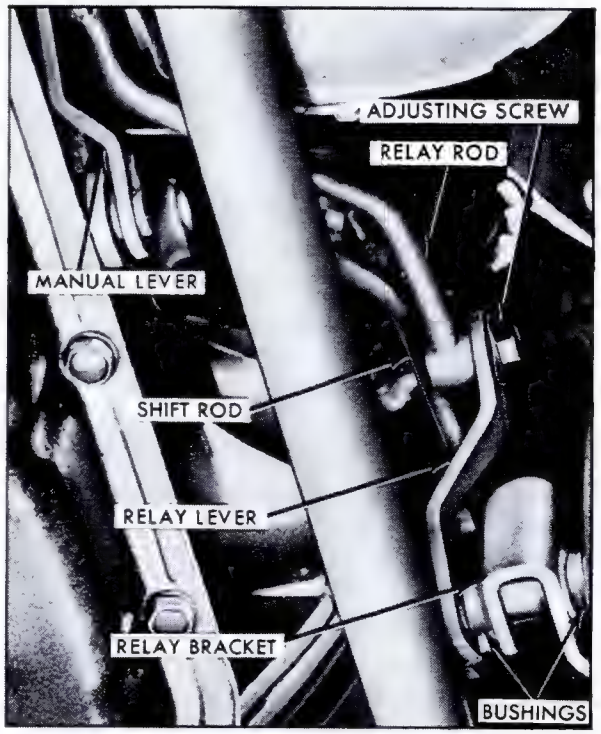


Fig. 7-146 Adjusting Manual Linkage

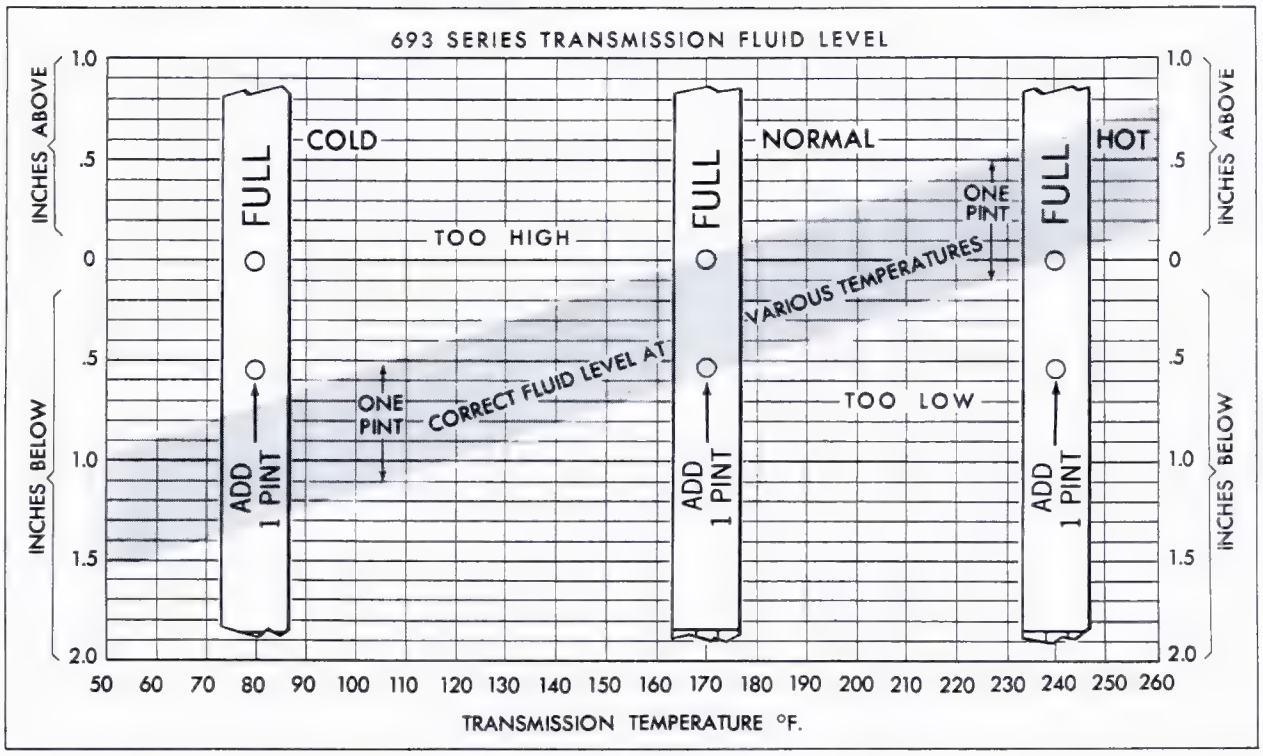


Fig. 7-147 Transmission Oil Level (693 Only)

NOTE: Whenever linkage is readjusted, check for proper operation of neutral safety switch, parking brake release and back-up lights. Refer to Section 12, Note 41 for proper method of checking function of neutral switch.

23. Transmission Downshift Switch Adjustment

The procedure for adjusting the transmission downshift switch is described in Note 5.

24. Downshift Solenoid Circuit Check

The procedure for checking the downshift solenoid circuit is described in Note 6.

25. Checking and Adding Fluid

CAUTION: Car level and oil temperature are particularly important when checking fluid level on a Turbo Hydra-matic transmission. Careful attention to the following procedures is necessary in order to determine the actual fluid level.

a. Turbo Hydra-Matic Oil Recommendations

Whenever fluid is added to the 1969 Fleetwood Eldorado transmission use only Dexron transmission fluid. General Motors Dexron automatic transmission fluid has been especially formulated and tested for use in the 1969 Cadillac Turbo Hydra-matic transmission. Other automatic transmission fluids identified with the mark Dexron are also recommended.

NOTE: Use either Dexron automatic transmission fluid or type A automatic transmission fluid identified by the mark "AQ-ATF" followed by a number and the suffix letter (AQ-ATF-XXXXA) in all 1967 Fleetwood Eldorado transmissions.

The transmission dipstick and filler tube on the 1969 Fleetwood Eldorado is located under the hood at the left center side of the engine.

The bottom pan should be drained every 24,000 miles or 2 years, whichever occurs first, and fresh fluid added to obtain the proper level on the dipstick Fig. 7-147. For cars subjected to heavy city traffic during hot weather, or in commercial use, when the engine is regularly idled for prolonged periods, the bottom pan should be drained every 12,000 miles.

The oil intake system incorporates an intake pipe and strainer assembly that should be replaced after the first 24,000 miles or 2 years, whichever occurs first. In any case of a major transmission failure, the strainer assembly must be replaced.

b. Checking and Adding Fluid

Fluid level should be checked at every engine oil change. The full "F" and "ADD" dimple marks on the transmission dipstick indicate one

pint difference. Correct fluid level is determined at normal operating temperature (180°F - 190°F). Careful attention to transmission oil temperature is necessary, as proper fluid level at low operating temperatures will be below the "ADD" mark on the dipstick, Fig. 7-147, and proper fluid level at higher operating temperatures will rise above the full "F" mark. Fluid level must always be checked with car on level surface, and with engine running to make certain converter is full. To determine proper fluid level, see Note 7b for procedure.

c. Draining Bottom Pan and Replacing Intake Pipe and Strainer Assembly

To drain bottom pan only, eliminate steps 5 and 6.

1. Remove dipstick from filler tube and insert a length of hose secured to a suction gun down the dipstick. Remove enough transmission fluid so that bottom pan will not overflow when removed.
2. Raise car on hoist or place on jack stands, and provide container to collect draining oil.
3. Remove bottom pan and gasket. Discard gasket.
4. Drain fluid from bottom pan. Clean pan with solvent and dry thoroughly with clean compressed air.
5. Remove intake pipe and strainer assembly. Remove and discard intake pipe O-ring.
6. Install new intake pipe O-ring into pipe bore in transmission case and install new intake pipe and strainer assembly.
7. Install new gasket on bottom pan and install bottom pan. Tighten bottom pan attaching screws to 12 foot-pounds.
8. Lower car and add five quarts of transmission fluid through filler tube when replacing intake pipe and strainer assembly. When draining bottom pan only, add four quarts of transmission fluid.
9. Operate engine at 800 rpm for approximately 1-1/2 minutes with selector lever in park "P" position.
10. Reduce engine speed to slow idle and check fluid level. Add fluid to bring to proper level, Fig. 7-147.

d. Adding fluid to Fill Dry Transmission and Converter Assembly

The fluid capacity of the Turbo Hydra-matic transmission and converter assembly is approximately 13 quarts, but correct level is determined by mark on dipstick rather than by amount added. It is important that proper level be maintained. In cases of transmission overhaul, when a complete fill is required, including converter, proceed as follows:

1. Add 9 quarts of transmission fluid through filler tube.
2. Operate engine at 800 rpm for approximately 1-1/2 minutes with selector lever in park "P" position.
3. Reduce engine speed to slow idle.
4. Check fluid level and add additional fluid to bring to proper level, Fig. 7-147.

e. Sprocket Housing Cover Removal

If the sprocket housing cover is removed, add transmission oil as described in Note b.

26. Towing Instructions

1969 Cadillac Fleetwood Eldorado cars cannot be started by pushing, and this procedure should never be attempted. If the car cannot be started in the normal manner or by the use of jumper cables, it should be towed to the nearest authorized service facility.

It is recommended that the car be towed with the front wheels off the ground. The car can be towed, however, with the rear wheels off the ground, if there is damage to the rear wheel area. In this event, the selector lever should be placed in Neutral "N" position, and the vehicle towed at speeds not to exceed 35 mph for distances up to 50 miles.

Before towing, check transmission fluid level. Fluid level must be above full mark on the dipstick with engine "OFF" Always tow car with transmission shift lever in Neutral position.

If tow requires raising front or rear of car, wheels should be lifted just slightly off the ground. When towing with rear wheels raised, tie down steering wheel with front wheels in straight ahead position. If keys are not available, see special towing instructions sent to each dealer.

27. Units That Can Be Removed with Transmission in Car

The following units can be removed from the transmission without removing transmission from car.

While the detailed procedure for removing each of the units is not outlined separately, the procedures covered under the transmission disassembly and assembly will apply.

a. Governor Assembly

Removal - Note 30b
Disassembly - Note 31k
Installation - Note 31k

b. Speedometer Driven Gear Assembly

Removal - Note 30c
Installation - Note 31k

c. Intake Pipe and Strainer Assembly and Bottom Pan

Removal - Note 30d
Installation - Note 31j

d. Control Valve Assembly, Governor Pipes, Detent Spring and Roller Assembly, and Check Balls

Removal - Note 30f
Disassembly - Note 31i
Installation - Note 31i

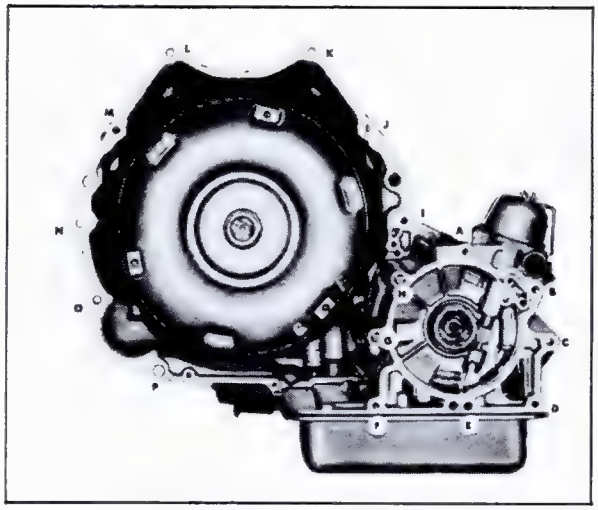


Fig. 7-148 Transmission Attaching Bolt Locations

e. Vacuum Modulator and Valve

Removal - Note 30a
Installation - Note 31j

f. Pressure Regulator

Removal - Note 30e
Installation - Note 31j

g. Front Servo and Rear Servo and Accumulator Assembly

Removal - Note 30g
Disassembly - Note 31h
Installation - Note 31h

h. Detent Lever, Manual Shaft, and Parking Linkage

Removal - Note 30i
Installation - Note 31h

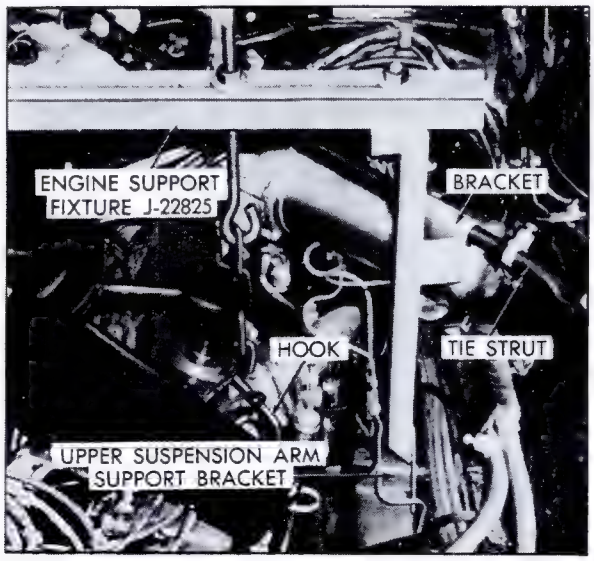


Fig. 7-149 Supporting Engine

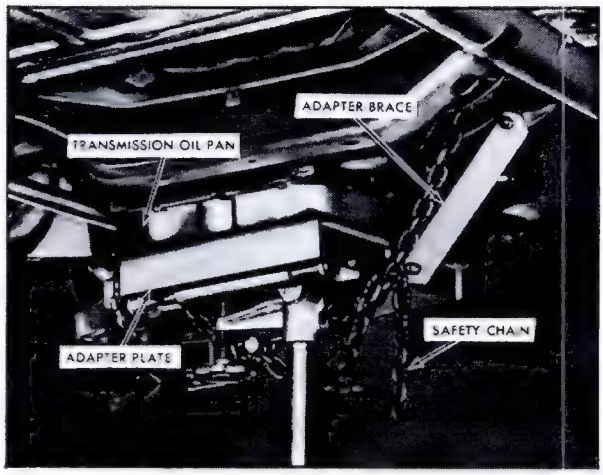


Fig. 7-150 Positioning Transmission Jack to Transmission

28. Transmission Removal and Installation (Fig. 7-148)

a. Removal

1. Disconnect negative battery cable.
2. Remove transmission dipstick.
3. Remove bolt securing filler tube bracket to exhaust manifold and remove filler tube, catching fluid in clean pan.
4. Remove and discard O-ring on filler tube.
5. Remove bolts at locations "A", "B" and "C", securing final drive case to transmission.
6. Disconnect speedometer cable from governor assembly.
7. Disconnect oil cooler pipes at transmission and at radiator, using Oil Cooler Pipe Wrench, J-21477. Cap pipes and plug connector holes in transmission and radiator.
8. Remove bolt securing cooler pipe bracket to final drive bracket and position pipes outboard of governor assembly.
9. Remove nut at location "H", securing final drive case to transmission.
10. Remove bolts at locations "I", "J", "K" and "L", securing transmission to engine. Vacuum modulator line bracket is also attached at "L".
11. Remove upper left bolt and lockwasher securing rear engine mount bracket to transmission.
12. Remove ground strap from cowl.
13. Remove upper left bolt securing converter cover plate to transmission by using a 7/16 inch universal socket and extension. Bolt can be seen from engine compartment.
14. Loosen two screws securing Automatic Level Control compressor to tie strut and position down.
15. Install Engine Support, J-22825, in engine with legs over upper suspension arm support brackets and brackets on tool over tie struts, Fig. 7-149. Install hooks under exhaust manifolds. Tighten bolts at legs and nuts at chains so that chains are in a true vertical position and put engine mounts under tension.

NOTE: Chains should be in true vertical position to minimize transmission to engine alignment during installation.

16. Raise car.
17. Disconnect leads from starter motor.
18. Remove bolt at location "O" securing starter motor to transmission case and remove ground strap from bolt.
19. Holding starter, remove bolt at location "P" and remove starter and starter wiring clip.
20. Remove three remaining bolts securing converter cover plate to transmission and remove cover plate.
21. Position transmission jack, equipped with front end drive transmission adapter plate, to transmission and install bolt securing adapter brace to transmission at starter motor lower mounting hole, Fig. 7-150.
22. Disconnect transmission downshift switch connector at transmission.
23. Remove vacuum pipe from vacuum modulator.
24. Secure transmission to transmission jack adapter plate with safety chain.
25. Remove three flex plate to converter attaching bolts.

NOTE: This can be done by installing a 9/16-18 screw and washer into end of crankshaft at harmonic balancer, after removing cork plug, and rotating converter and flex plate until screws are accessible for removal. Do not pry on flex plate ring gear to rotate flex plate and converter, as flex plate may be damaged.

26. Remove bolts at locations "M" and "N" securing transmission to engine.
27. Remove cotter pin securing relay rod to manual yoke on left side of transmission and separate relay rod from yoke.
28. Remove bolts at locations "D", "E", "F" and nut at location "G", securing final drive to transmission.

NOTE: Position drain pan under point where transmission and final drive meet as transmission fluid will be lost when transmission and final drive are separated.

29. Remove five bolts and washers securing rear of acromat to front cross bar and frame horns and allow acromat to hang free.
30. Through access holes in bottom of front frame crossmember remove two nuts and studs securing front engine mounts to front frame crossmember and engine.
31. Turn wheels all the way to left.

NOTE: This will give final drive additional clearance when it is pried forward.

32. Have helper, using large pry bar, shift engine assembly forward, while technician performing operation uses small pry bar to help separate transmission from engine and final drive.

CAUTION: Select pry points with care to avoid damaging any components. Final drive unit is limited in its forward travel.

33. After initial separation has been made, allow transmission oil to drain at final drive junction.
34. Remove two bolts and lockwashers on right side, securing rear engine mount bracket to transmission.
35. Through access holes in bottom of transmission support bar, remove two bolts, one each side, securing rear motor mounts to transmission support bar, and position motor mounts and bracket rearward to underbody.
36. While helper pries and holds engine assembly forward, move transmission rearward to disengage transmission case from dowels on engine adapter and to disengage final drive from studs on transmission case. Top of transmission should be tilted slightly rearward.

CAUTION: Final drive unit is limited in its forward travel.

37. Slowly lower transmission, making certain top of transmission case clears flex plate ring gear and splined input shaft of final drive, until converter is approximately half-way exposed from flex plate.
38. Install Converter Holding Clamp, J-21366, using a 5/16-18 nut to hold clamp screw to transmission case at location "N".

CAUTION: Converter Holding Clamp, J-21366, must be used to avoid the possibility of the converter becoming disengaged when the transmission is removed.

39. Lower transmission from car.

CAUTION: Rear engine mount bracket will follow the transmission from car; to avoid damage or injury, remove the bracket as soon as there is sufficient clearance.

40. Remove and discard final drive gasket and clean mounting surface of final drive.

b. Installation

1. Position transmission on jack equipped with adapter plate, under car.
2. Install new gasket on final drive, after first soaking gasket with transmission fluid.
3. Position rear engine mount bracket on top of transmission support bar against underbody.
4. Raise transmission in place until converter is approximately half-way covered by flex plate, and then remove Converter Holding Clamp, J-21366, from transmission.
5. While helper assists by holding engine assembly forward with pry bar, continue raising transmission, making certain top of transmission case clears splined input shaft of final drive, and position to engine.

NOTE: Make certain transmission chain cover insulator does not become dislodged.

6. Position transmission to engine assembly and final drive by aligning the following points in order listed, while helper assists:

a. Studs on transmission case to mounting holes in final drive.

b. Guide holes in transmission case to dowels on engine crankcase.

c. Internal flange on final drive to transmission.

NOTE: As engagement of splined final drive input shaft to transmission is hidden, extreme care must be taken to avoid damaging transmission or final drive assembly.

d. To facilitate engagement of final drive splines, rotate one front wheel while helper holds other.

NOTE: When alignment is complete and proper, gap between final drive case and transmission should not exceed 1/4 inch.

7. Loosely install bolts (3/8-16 x 1-1/4) at locations "D" and "F" attaching transmission to final drive and bolt (3/8-16 x 2-1/2) at location "N" attaching transmission to engine, alternately tightening bolts to avoid cocking transmission. Do not torque bolts at this time.

8. Working in engine compartment, loosely install bolt (3/8-16 x 1-3/8) at location "J" attaching transmission to engine crankcase. Do not torque bolt at this time.

9. Install bolt (3/8-16 x 1-3/8) at location "M" attaching transmission to engine. Do not torque bolt at this time.

10. Position rear engine mount brackets to transmission and loosely install three bolts and lockwashers securing bracket to transmission.

NOTE: Upper left bolt is installed from engine compartment.

11. Position rear engine mounts and bracket to transmission support bar and loosely install bolts through access holes in bottom of bar, attaching mounts to bar.

12. Reposition engine assembly, as necessary, and install two studs and nuts securing front motor mount to front frame crossmember. Tighten both front motor mount nuts to 30 foot-pounds.

13. Remove safety chain, remove bolt securing jack adapter plate to transmission case and remove transmission jack.

14. Torque the following bolts as specified.

a. Rear engine mounts to transmission support bar - 55 foot-pounds.

b. Rear engine mount to transmission (two on right side) - 55 foot-pounds.

c. Transmission to engine (location "M" and "N") - 30 foot-pounds.

CAUTION: The procedure for attaching the converter to the flex plate as described in steps 15 through 17 must be strictly followed. Any deviation from this procedure will result in improper installation and damage to flex plate and transmission.

15. Rotate converter until two of the three weld nuts on converter line up with two of the three holes in flex plate. Position converter so that weld nuts are flush with flex plate, making certain converter is not cocked and that pilot in center of converter is properly seated in crankshaft.

16. Install two flex plate to converter attaching bolts through accessible holes in flex plate and tighten finger tight.

17. Rotate flex plate and converter by rotating screw previously installed in forward end of crankshaft, until third hole is accessible. Install third bolt and tighten all bolts to 28 foot-pounds. Remove screw from crankshaft and install cork plug.

18. Install vacuum hose on vacuum modulator assembly.

19. Install transmission downshift switch at connector.

20. Position converter cover plate to transmission case and install two lower and one upper right bolts securing cover plate to transmission, tightening to 5 foot-pounds.

21. Position starter to transmission case and install bolt and starter motor wiring clip at location "P".

22. Position ground strap to transmission and install bolt securing ground strap and starter motor to transmission at location "O". Tighten bolts at locations "O" and "P" to 25 foot-pounds.

23. Install leads on starter motor.

24. Install bolts at locations "C" and "E" and nut at location "G", securing transmission to final drive.

25. Torque bolts at locations "C" through "F" to 25 foot-pounds.

26. Position acromat to front cross bar and frame horns and install five retaining bolts and washers.

27. Position relay rod to manual yoke and secure with cotter pin.

28. Check operation of manual linkage and adjust, if necessary, as described in Note 22.

29. Lower car.

30. Remove Engine Support, J-22825.

31. Install bolts at location "A" and "B" and nut at location "H", securing transmission to final drive. Tighten bolts to 25 foot-pounds.

32. Install upper left bolt securing converter cover plate to transmission using a 7/16 inch universal socket and extension.

33. Install bolts at locations "I", "K" and "L" securing transmission to engine and adapter. Vacuum modulator pipe bracket is also installed at location "L".

34. Torque bolts at locations "I", "J", "K" and "L" to 25 foot-pounds.

35. Tighten brass cooler pipe connectors at case to 28 foot-pounds. Clean ends of cooler pipes with solvent, reposition cooler pipes, and connect pipes to transmission using Oil Cooler Pipe Wrench, J-21477. Tighten fittings to 28 foot-pounds.

36. Connect oil cooler pipes to radiator, using

Oil Cooler Pipe Wrench, J-21477. Tighten fittings to 40 foot-pounds.

37. Install cooler pipe bracket to final drive bracket with attaching bolt.

38. Install speedometer cable to governor.

39. Install new O-ring on transmission filler tube and install filler tube through hole in final drive case.

40. Position transmission filler tube bracket to exhaust manifold and install retaining bolt.

41. Install body ground strap to cowl.

42. Connect negative battery cable.

43. Fill transmission with fluid as required, see Note 25.

44. Inspect brake lines for possible damage.

29. Installing Transmission on Holding Fixture

1. With transmission on portable jack, remove Converter Holding Clamp, J-21366, and then remove converter assembly from transmission by pulling converter straight out of housing.

CAUTION: Converter with oil weighs approximately 50 pounds. Be careful not to drop or damage converter when removing it.

If transmission is to be overhauled, place converter on opposite end of workbench from transmission Holding Fixture Base.

2. Position Transmission Holding Fixture, J-22240, to transmission, Fig. 7-151.

3. Attach Holding Fixture, J-22240, to transmission using a 3/8-16 x 2-1/4 inch bolt and nut at location "J". Use special screw provided with Holding Fixture to attach Holding Fixture to rear side of transmission case.

4. Tighten adjustable case locator pivot bolt to boss on side of transmission case.

NOTE: Do not overtorque adjustable case locator nut.

5. Install Transmission Holding Fixture, J-22240, and transmission into Holding Fixture Base, J-3289-01, then install lock pin in base.

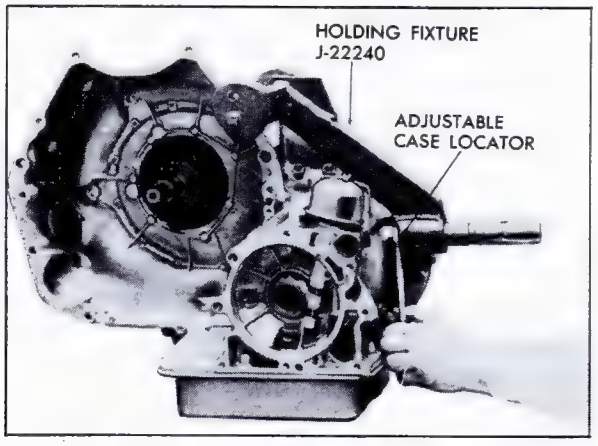


Fig. 7-151 Attaching Holding Fixture to Transmission

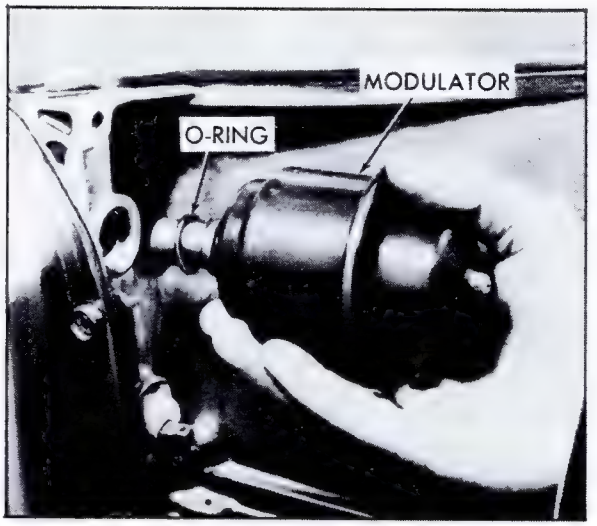


Fig. 7-152 Removing Vacuum Modulator and O-Ring

6. Remove transmission jack from transmission.

7. Provide a container to catch any oil that may drain from transmission.

30. Major Transmission Components Removal (Fig. 7-122)

a. Remove Vacuum Modulator and Valve

NOTE: Unit may be removed without removing transmission or bottom pan, after removing vacuum hose.

1. Remove vacuum modulator attaching screw and retainer from transmission case.

2. Remove modulator assembly and O-ring from transmission case. Remove and discard O-ring from vacuum modulator, Fig. 7-152.

3. Remove modulator valve from transmission case, Fig. 7-153.

NOTE: Modulator bushing is a tight fit in transmission case and should not be removed forcibly unless it is damaged, scored, or otherwise deformed.

b. Remove Governor Assembly

NOTE: Unit may be removed without removing transmission from car.

1. Force top of spring clip downward, releasing governor assembly.

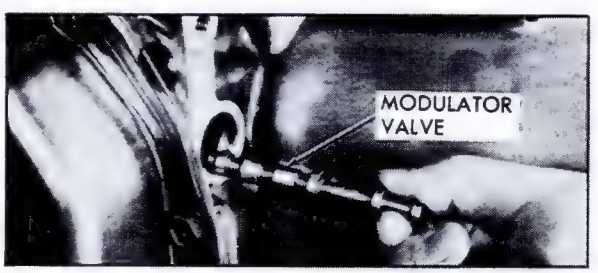


Fig. 7-153 Removing Modulator Valve

Fig. 7-154 Removing Governor Assembly

2. Remove governor assembly from case, and remove square-cut O-ring from governor assembly and discard O-ring, Fig. 7-154.

NOTE: The governor assembly, including the driven gear, is not serviceable and must be replaced as an assembly.

c. Remove Speedometer Driven Gear Assembly

NOTE: Unit may be removed without removing transmission from car or without removing governor assembly.

1. Remove attaching screw and retainer from left side of case. Apply slight pressure to remove sleeve and speedometer driven gear.
2. Remove and discard O-ring from speedometer driven gear assembly.

d. Remove Intake Pipe and Strainer Assembly and Bottom Pan

NOTE: Units may be removed with transmission in car. In cases of transmission failure, intake pipe and strainer must be replaced.

1. Rotate transmission and Holding Fixture in Holding Fixture Base so that transmission bottom pan is up. Position container to catch any fluid which may drain from transmission.
2. Remove 13 bottom pan attaching screws.
3. Remove bottom pan and gasket, discarding gasket.
4. Lift out intake pipe and strainer assembly, Fig. 7-155.
5. Remove and discard intake pipe O-ring, Fig. 7-155.

e. Remove Pressure Regulator Valve

NOTE: Unit may be removed with transmission in car after removing bottom pan.

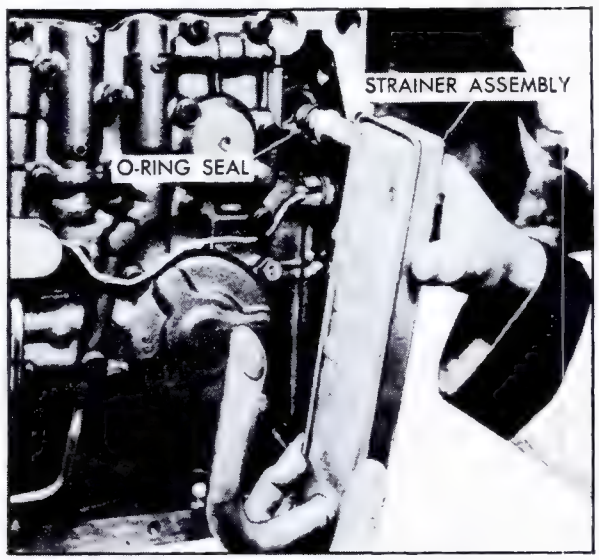


Fig. 7-155 Removing Intake Pipe and Strainer Assembly

1. Compress regulator boost valve bushing against pressure regulator spring and remove snap ring using Snap Ring Pliers, J-5403 (#21), Fig. 7-156.

CAUTION: Pressure regulator spring is under extreme pressure.

2. Remove regulator boost valve bushing and valve.
3. Remove pressure regulator spring.
4. Remove regulator valve, spring retainer, and spacer or spacers if present.

f. Remove Control Valve Assembly, Governor Pipes, Detent Spring and Roller Assembly, and Check Balls

NOTE: Units may be removed with transmission in car, after removing bottom pan.

1. Remove attaching screw and remove detent roller and spring assembly.
2. Disconnect detent (white) wire from case connector.

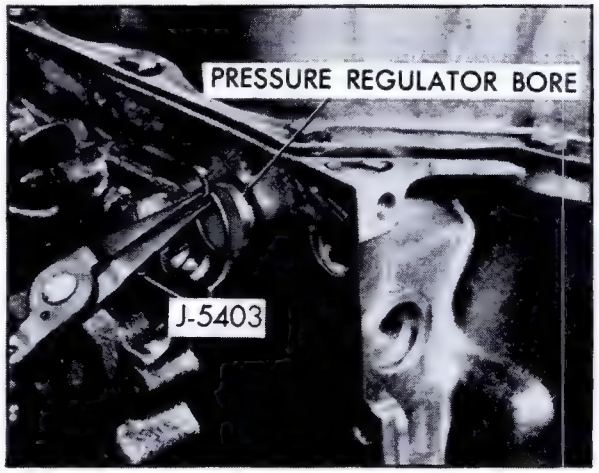


Fig. 7-156 Removing Pressure Regulator Valve

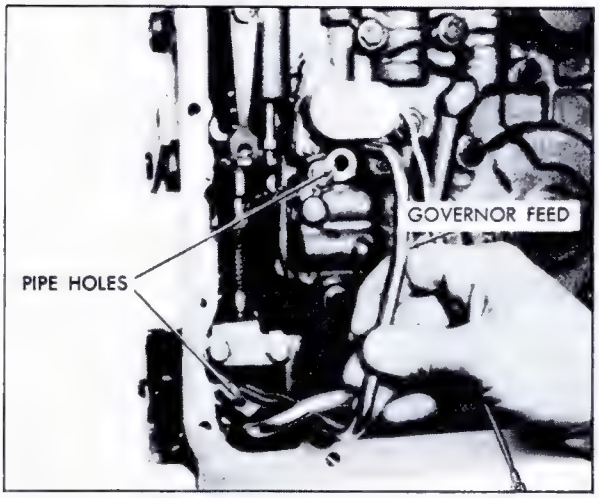


Fig. 7-157 Removing Governor Feed Pipe

3. Remove governor feed pipe from transmission case and valve body by lifting straight out, Fig. 7-157.

4. Remove twenty remaining control valve assembly attaching screws. Do not remove detent solenoid attaching screws at this time.

5. Remove control valve assembly with remaining governor pipe attached, Fig. 7-158.

CAUTION: Do not allow manual valve to fall out of its bore in control valve assembly.

6. Remove remaining governor pipe from valve body.

7. Remove control valve assembly to spacer gasket.

8. Remove control valve spacer and spacer-to-transmission case gasket, Fig. 7-159.

CAUTION: If control valve is removed in car, seven check balls will come down with spacer.

9. Remove seven check balls from cored passages in transmission case.

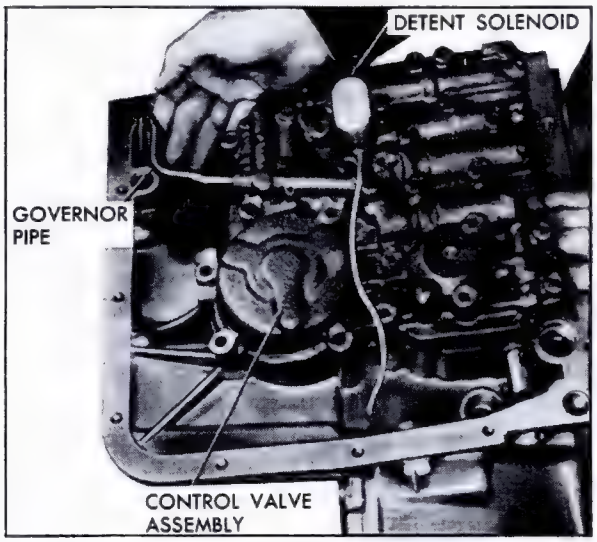


Fig. 7-158 Removing Control Valve Assembly

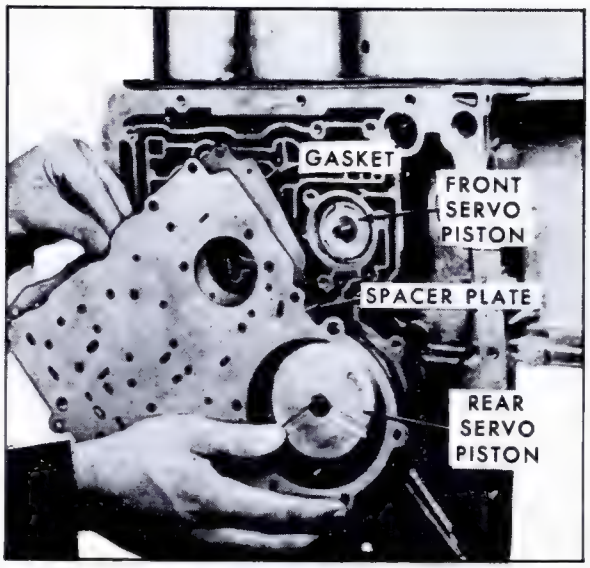


Fig. 7-159 Removing Control Valve Spacer and Gasket

NOTE: The eighth check ball is held in by a retainer and should not be removed unless replacement is required.

g. Remove Front Servo Piston and Rear Servo Piston

NOTE: Units may be removed with transmission in car after removing bottom pan and control valve assembly.

1. Lift front servo piston, washer, pin, retainer and spring out of transmission case, Fig. 7-159.

2. Remove rear servo assembly from transmission case, Fig. 7-159.

3. Remove rear servo accumulator spring.

4. Make band apply pin selection check to determine proper size pin to use at time rear servo is assembled. Proceed as described in Step h.

h. Band Apply Pin Selection Check (Fig. 7-160)

NOTE: Check may be made with transmission in car. Remove bottom pan, control valve assembly, and rear servo.

1. Position Adapter Plate, J-21370-8, on transmission case over rear servo bore, and, using screws provided with Adapter Plate, attach Band Apply Pin Selector Gage, J-21370 to Adapter Plate.

2. Position Band Apply Pin Selector Gage, J-21370, with hex nut on side of gage facing toward converter housing, and smaller diameter end of Gage Pin, J-21370-7, in servo pin bore.

3. Secure Adapter Plate to transmission case with two 5/16-18 x 1 inch screws, tightening screws to 18 foot-pounds and secure Selector Gage to Adapter Plate, tighten attaching screws to 18 foot-pounds. Make certain that stepped gage pin is free to move up and down in both tool and servo pin bore. Stepped side of pin must face rear of transmission case.

Fig. 7-160 Band Apply Pin Selection Check

Band apply pins are available in three sizes as shown in the following chart:

Identification	Length
Three Rings	Long
Two Rings	Medium
One Ring	Short

Identification ring is located on band lug end of pin. Selecting the proper pin is equivalent to adjusting band.

4. To determine proper size pin to use, apply 25 foot-pounds torque on hex nut on side of gage. This will cause lever on top of gage to depress stepped gage pin into servo pin bore, simulating actual operating conditions. Note relation of steps on gage pin and machined surface on top of gage. Determine proper size pin as follows:

a. If machined surface on top of gage is even with or above upper step on gage pin, long size pin (three rings) is required.

b. If machined surface on top of gage is between upper and lower steps on gage pin, medium size pin (two rings) is required.

c. If machined surface on top of gage is even with or below lower step on gage pin, short size pin (one ring) is required.

5. If new pin is required, make note of pin size required, and remove gage from transmission case.

i. Remove Detent Lever, Manual Shaft, and Parking Linkage (Fig. 7-161)

NOTE: Units may be removed with transmission in car after removing bottom pan and detent roller and spring assembly from control valve assembly.

1. Remove pin securing manual shaft to case by pulling straight out.

2. Loosen locknut securing detent lever to manual shaft.

3. Pry or work detent lever loose from ground flats on manual shaft.

4. Remove manual shaft from case bore and remove and discard O-ring seal from manual shaft.

NOTE: Be careful not to drop jam nut inside of case.

5. Remove detent lever and parking brake actuator assembly from case and remove actuator assembly from detent lever.

6. Remove parking brake bracket attaching screws and remove bracket.

7. Remove retainer pin securing parking pawl shaft to transmission case by pulling straight out.

8. Remove parking pawl shaft, parking pawl and return spring.

j. Remove Sprocket Cover, Link Assembly, Drive and Driven Sprockets

1. Rotate transmission in holding fixture base so that sprocket cover is up and remove eighteen cover attaching screws.

2. Remove cover and gasket and discard gasket.

3. Install Snap Ring Pliers, J-4646, into sprocket bearing retaining snap rings located under the drive and driven sprockets, and remove snap rings from retaining grooves on support housings, Fig. 7-162.

NOTE: Leave snap rings in a loose position between sprockets and bearing assemblies.

4. Remove drive and driven sprockets, link assembly, bearings, and shafts simultaneously by alternately pulling upwards on the drive and driven sprockets until the bearings are out of the drive and driven support housings, Fig. 7-163.

NOTE: If the sprockets are difficult to remove, place a small piece of masonite, or similar material between the sprocket and sprocket support cover. Using a 1/2 x 9 inch pry bar, alternately pry upward under each sprocket on sprocket support cover. Do not pry on the guide links or the aluminum case. Pry only on the sprockets, Fig. 7-164.

5. Remove link assembly from drive and driven sprockets.

6. Remove the hook type oil seal ring from turbine shaft.

7. Inspect drive and driven sprocket bearing assemblies for rough or defective bearings.

NOTE: Do not remove bearing assemblies from drive and driven sprockets unless they need replacement.

8. If removal of bearing assembly from drive and/or driven sprockets is necessary, proceed as follows:

a. Remove sprocket to bearing assembly retaining snap ring using Snap Ring Pliers, J-8059, Fig. 7-165.

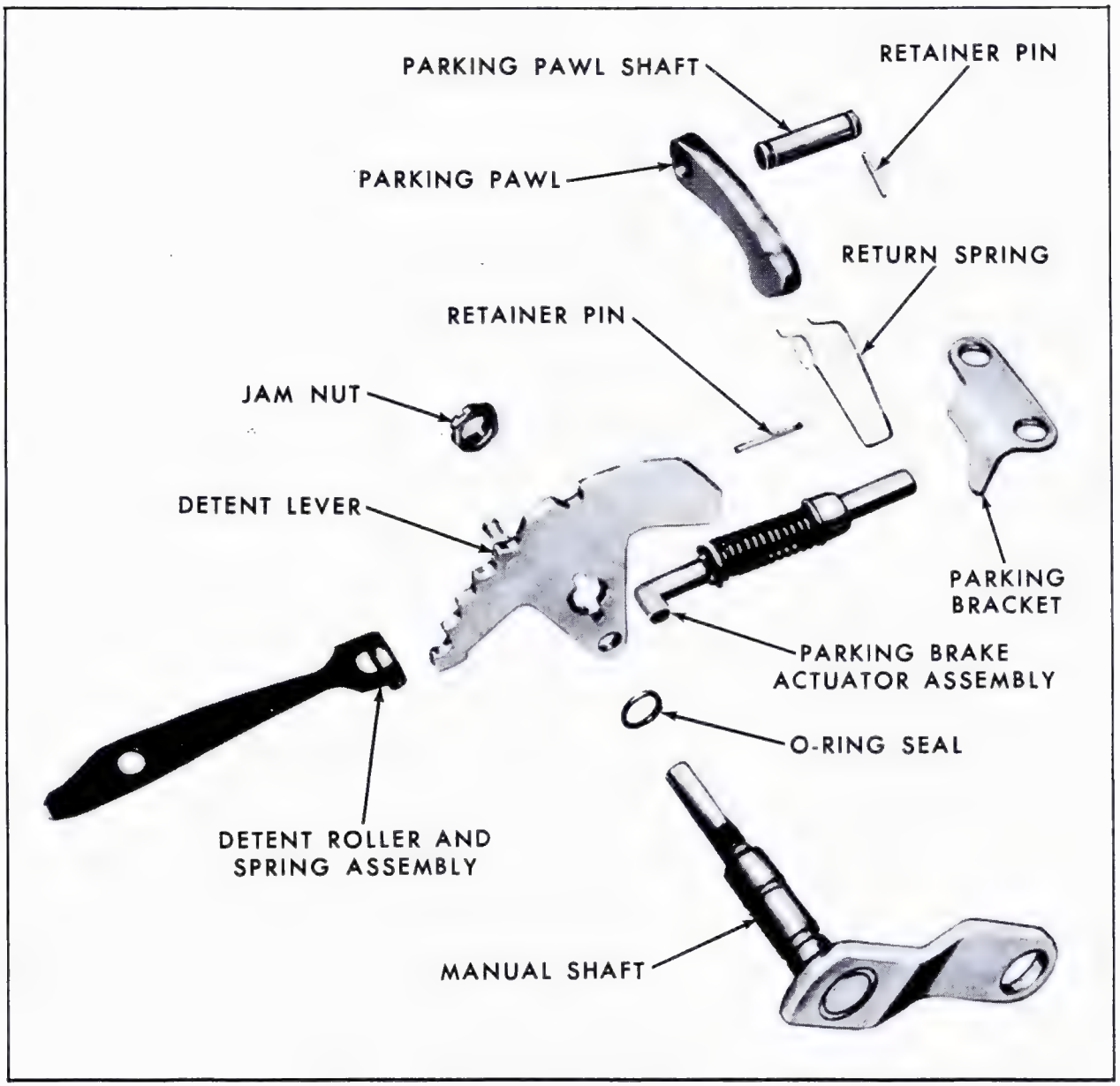


Fig. 7-161 Manual and Parking Linkage Disassembled

b. Mount sprocket, with turbine or input shaft placed down between two 2" x 4" x 10" wood blocks.

NOTE: Wood blocks are positioned on sides or ends, depending on which bearing is to be replaced.

c. With a hammer and brass rod, drive the inner race, alternately through each of the access openings, until the bearing assembly is removed from the sprocket hub, Fig. 7-166.

k. Inspect Drive Sprocket and Turbine Shaft, and Link Assembly

1. Inspect drive sprocket teeth for nicks, burrs, scoring, galling, and excessive wear.

NOTE: Wear pattern at bottom of tooth form is normal.

2. Inspect drive sprocket to ball bearing retaining snap ring for damage.

3. Inspect drive sprocket ball bearing inner race mounting surface for damage.

4. Inspect turbine shaft for open lubrication passages. Run a tag wire through the passages to be sure they are open. See lubrication chart for passage location, Fig. 7-141.

5. Inspect spline for damage.

6. Inspect the ground bushing journals for damage.

7. Inspect the hook type oil seal groove for damage or excessive wear.

8. Inspect the turbine shaft for cracks or distortion.

9. Inspect the link assembly for damage or loose links.

NOTE: Check the guide links. Guide links

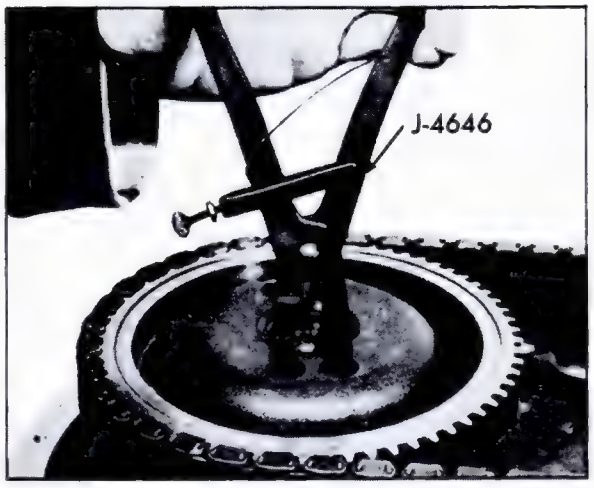


Fig. 7-162 Removing Sprocket Snap Ring

are the wide outside links on each side of the link assembly.

l. Inspect Driven Sprocket and Input Shaft

1. Inspect driven sprocket teeth for nicks, burrs, scoring, galling, and excessive wear.

NOTE: Wear pattern at bottom of tooth form is normal.

2. Inspect sprocket to ball bearing retaining snap ring for damage.
3. Inspect ball bearing inner race mounting surface for damage.
4. Inspect input shaft for open lubrication holes. Run a tag wire through the holes to be sure they are open. See lubrication chart, Fig. 7-141, for location of holes.
5. Inspect spline for damage.
6. Inspect ground bushing journal for damage.

m. Install Sprocket Bearings

1. Turn sprocket so that turbine or input shaft is pointing upward.
2. Install new sprocket bearing as follows:

a. Install support snap ring, letter side down, onto shaft.

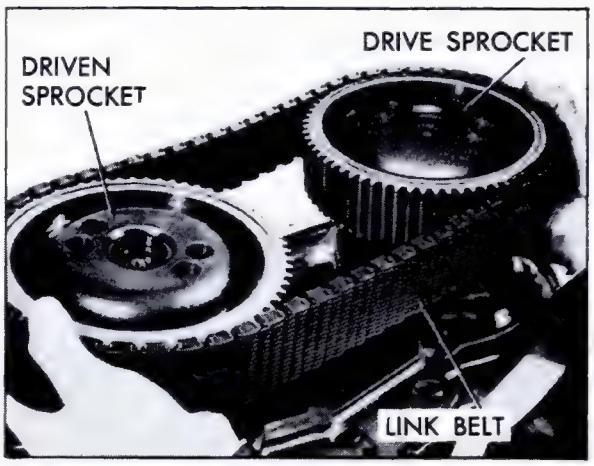


Fig. 7-163 Removing Sprockets and Link Assembly

Fig. 7-164 Removing Tight Sprockets

b. Assemble bearing assembly on turbine or input shaft.

c. Using a piece of pipe, drive the bearing assembly onto the hub of the sprocket until it is resting on the bearing seat of the sprocket.

CAUTION: Use pipe that closely fits I.D. of bearing assembly but does not contact shaft.

d. Install sprocket to bearing assembly retaining snap ring into groove in sprocket hub.

3. Install hook type oil seal ring on turbine shaft.

NOTE: Turbine and/or input shaft may appear not to be pressed fully into the sprocket. Do not attempt pressing shaft further as a specific length dimension is held during initial assembly.

n. Front Unit End Play Check

1. Install Front Unit End Play Checking Tool, J-22241, into driven sprocket housing so that the

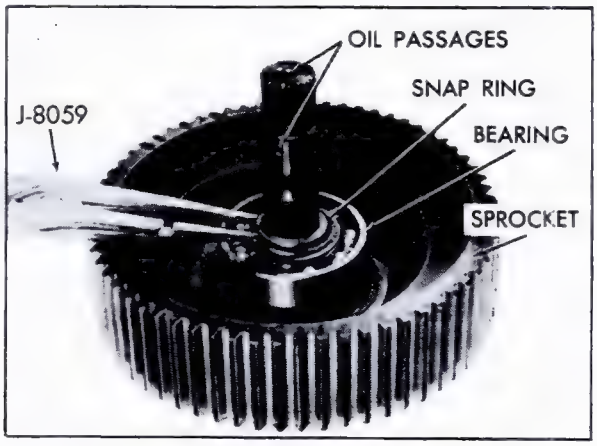


Fig. 7-165 Removing Sprocket Bearing Snap Ring

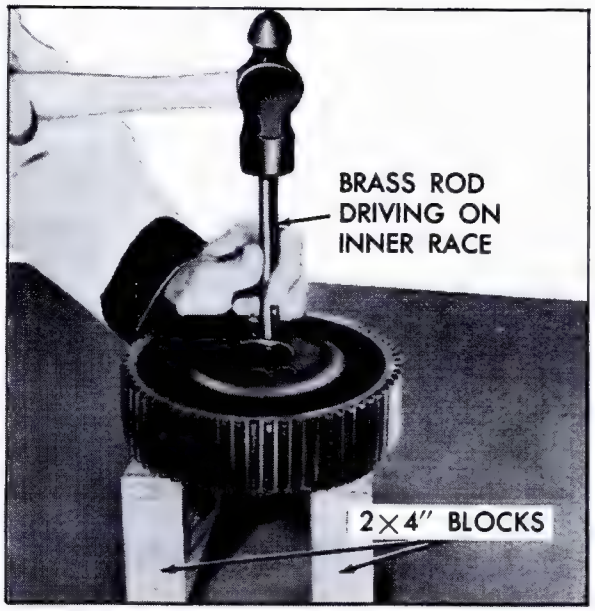


Fig. 7-166 Removing Sprocket Bearing Assembly

urethane on the tool can engage the splines in the forward clutch housing. Let the tool bottom on the mainshaft and then withdraw it approximately 1/8 inch and tighten nut on tool, Fig. 7-167.

2. Remove one bolt from the driven support housing, and install Slide Hammer Bolt, J-6125-1, into bolt hole in driven support housing.

NOTE: Do not thread slide hammer bolt deep enough to interfere with forward clutch housing travel.

3. Mount Dial Indicator, J-8001, on slide hammer bolt and index indicator to register with the Front Unit End Play Checking Tool, J-22241, Fig. 7-167, and push tool down to remove slack.

4. Push and hold output flange upward. Place a screw driver in case opening at parking pawl area and push upward on output carrier.

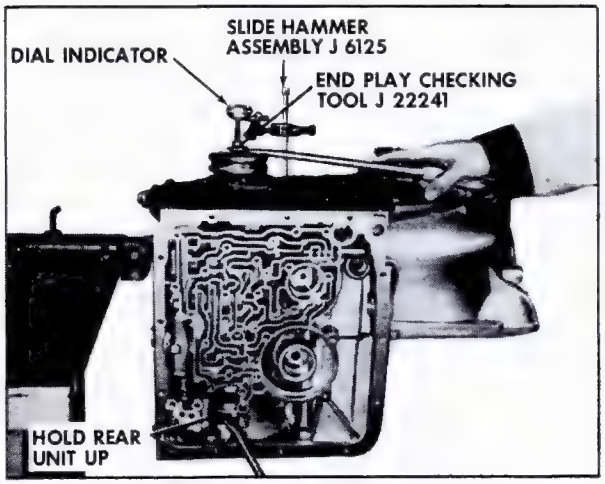


Fig. 7-167 Checking Front Unit End Play

5. Place another screw driver between the metal lip of the end play tool and the driven sprocket housing and push upward on the metal lip of the end play tool and read the resulting end play, which should be between .003" and .024".

The selective washer controlling this end play is the phenolic thrust washer located between the driven support housing and the forward clutch housing. If more or less washer thickness is required to bring the end play within specifications, select the proper washer from the chart below:

THICKNESS	COLOR
.060-.064	Yellow
.071-.075	Blue
.082-.086	Red
.093-.097	Brown
.104-.108	Green
.115-.119	Black
.126-.130	Purple

NOTE: An oil soaked washer may tend to discolor so that it will be necessary to measure the washer with a set of one inch micrometers to determine its actual thickness.

6. Remove end play tool from transmission and remove dial indicator and slide hammer bolt from transmission.

o. Remove Oil Pump

1. Remove two opposite pump attaching bolts from the drive support housing.
2. Install two 5/16-18 x 4" guide pins in holes from previously removed bolts.
3. Remove the remaining pump attaching bolts from the drive support housing.
4. With one hand hold the under side of the pump and gently tap the guide pins until the pump is removed from the case.

p. Remove Pump Cover Plate and Drive and Driven Support Housing Assemblies

1. Remove the twenty-three pump cover plate-to-case attaching screws and remove pump cover plate. Do not remove sprocket support housing bolts at this time.
2. Remove pump cover plate and plate-to-case face gasket. Discard gasket.

NOTE: Drive and driven support housing assemblies are pressed into and removed with the pump cover plate. Do not remove them unless it is necessary.

3. Remove two hook type oil seal rings from the driven support housing.
4. Remove the front unit end play selective phenolic thrust washer from the hub of the driven support housing.
5. If necessary to remove the drive and driven sprocket support housing assemblies, proceed as follows:

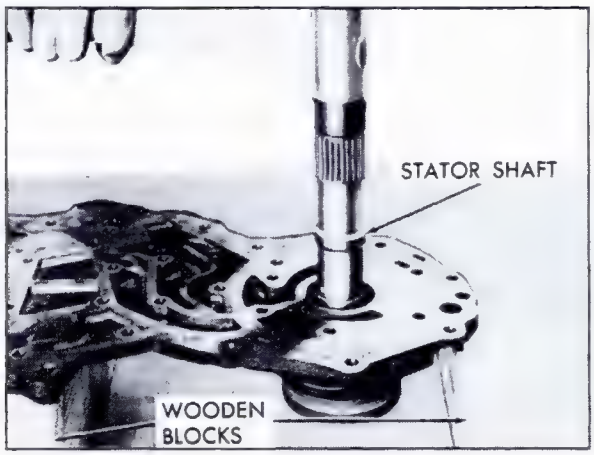


Fig. 7-168 Removing Drive Sprocket Support

a. Remove the remaining sprocket support to pump cover plate attaching bolts.

b. Support cover plate on wooden blocks and using a plastic mallet, vigorously strike the stator shaft of the drive sprocket support, Fig. 7-168, and the hub of the driven sprocket support, Fig. 7-169, until they are removed from their pump cover plate bores.

NOTE: When driving the housings out of the pump cover plate avoid damaging or distorting the stator shaft or the ring grooves in the hub of the driven housing.

c. Remove and discard housing to pump cover plate gaskets.

d. Install drive sprocket support housing to pump cover plate gasket.

e. Install drive sprocket support housing into pump cover plate by using a plastic mallet to seat the housing. Use bolts for guides, Fig. 7-170.

f. Install driven sprocket support housing to pump cover plate gasket.

g. Install driven sprocket support housing to pump cover plate attaching bolts for gasket guides.

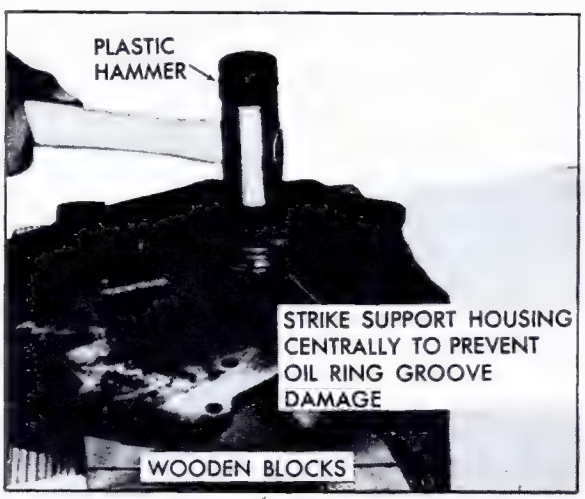


Fig. 7-169 Removing Driven Sprocket Support

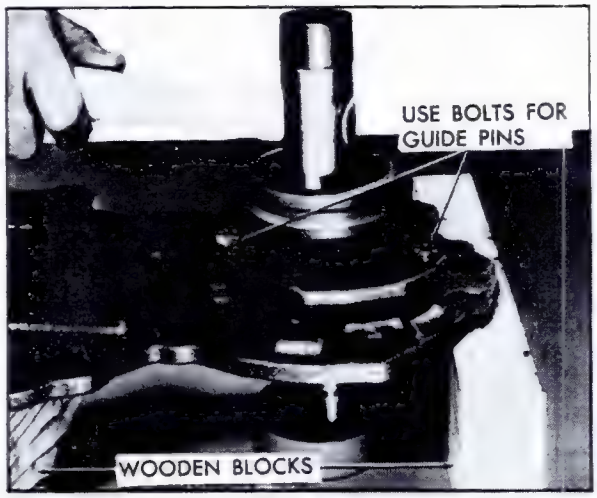


Fig. 7-170 Installing Driven Sprocket Support

h. Install driven sprocket support housing into pump cover plate by using a plastic mallet to seat the housing.

i. Install all but one driven support housing to pump cover plate attaching bolts. Torque to 20 ft. lbs.

6. Install proper front unit end play phenolic selective thrust washer on the hub of the driven sprocket support housing. Use micrometer to determine the actual thickness of the phenolic thrust washer.

7. Install two hook type oil seal rings into the grooves in the hub of the driven sprocket support housing, Fig. 7-171.

q. Remove Forward Clutch Assembly, Direct Clutch Assembly, Sun Gear Shaft, and Front Band

1. Remove forward clutch assembly from transmission, Fig. 7-172, by installing Front End Play Checking Tool, J-22241, into forward clutch and lifting forward clutch straight out.

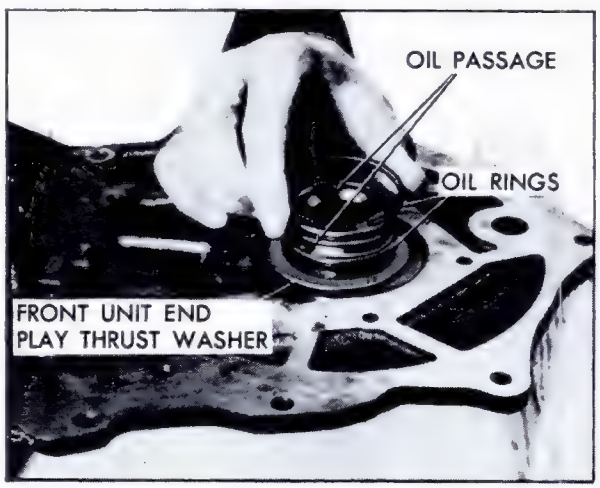


Fig. 7-171 Installing Oil Rings on Driven Sprocket Support

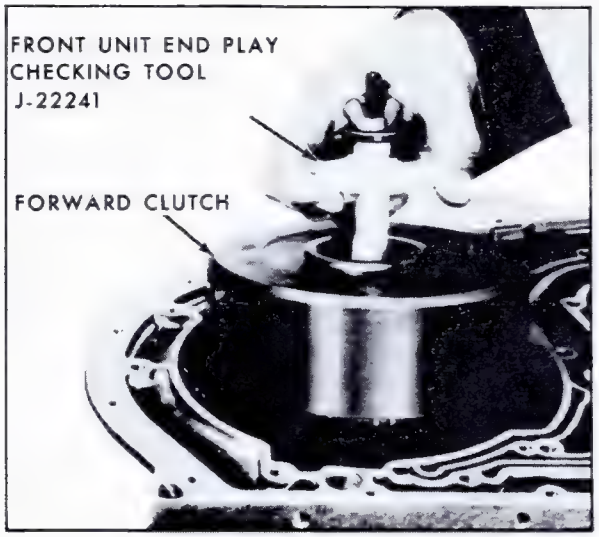


Fig. 7-172 Removing Forward Clutch

2. Remove forward clutch hub to direct clutch housing thrust washer if it did not come out with forward clutch assembly.

3. Remove direct clutch and intermediate sprag assembly by lifting straight out. Sun gear shaft may come out with direct clutch assembly.

4. Remove sun gear shaft if not previously removed.

5. Remove front band assembly.

NOTE: Check rear unit end play at this time. Proceed as described in Step r.

r. Rear Unit End Play Checking Procedure

1. Rotate transmission in holding fixture base so that forward end of transmission is up.

2. Install Speedometer Puller Bolt, J-21797, in one of the differential mounting bolt holes on end of transmission case.

3. Mount Dial Indicator, J-8001, on Bolt J-21797, and index indicator to register with flat surface on end of output flange, Fig. 7-173.

4. Set dial indicator to zero.

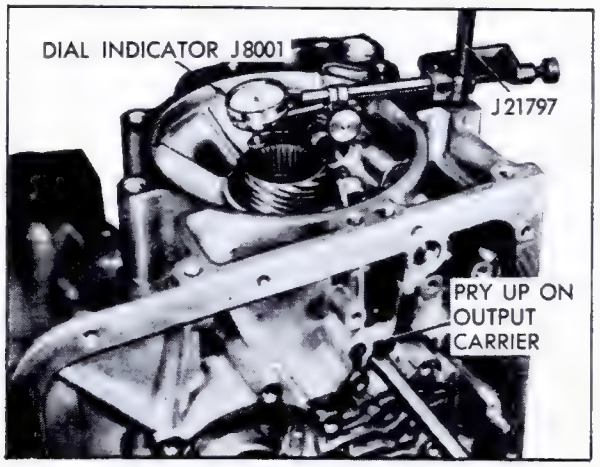


Fig. 7-173 Checking Rear Unit End Play

5. Using a screw driver, move output flange in and out. Note resulting travel or end play for selection of washer for use at time of transmission assembly. End play should be .003 inch - .019 inch.

The selective washer controlling this end play is the steel washer with the three tabs, located between thrust washer and rear face of transmission case. Notches and/or numerals on the tabs serve to identify washer thickness.

If a different washer thickness is required to bring end play within specifications, it can be selected from the following chart. The tabs will show identification notches, numerals or both.

THICKNESS	IDENTIFICATION NOTCH AND/OR NUMERAL	
.074 - .078	None	1
.082 - .086	On Side of 1 Tab	2
.090 - .094	On Side of 2 Tabs	3
.098 - .102	On End of 1 Tab	4
.106 - .110	On End of 2 Tabs	5
.114 - .118	On End of 3 Tabs	6

6. Remove Dial Indicator, J-8001, and Bolt, J-21797, from transmission and rotate transmission so that rear end of transmission is up.

s. Remove Remaining Components

1. Remove center support bolt from transmission case, Fig. 7-174, using a 3/8 inch 12-point thin wall deep socket.

2. Remove intermediate clutch backing plate to case snap ring.

3. Remove intermediate clutch backing plate, and three composition and three steel clutch plates.

4. Using a needle-nose pliers, or screwdriver, remove center support to case snap ring.

5. Install Gear Assembly Remover and Installer Adapter, J-21795, on end of main shaft so that tangs engage groove in shaft. Using Slide Hammer Handle, J-6125, and Speedometer Puller Bolt,

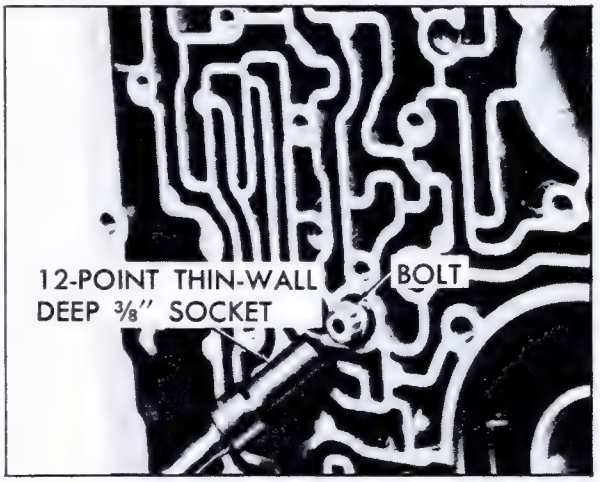


Fig. 7-174 Removing Center Support Bolt

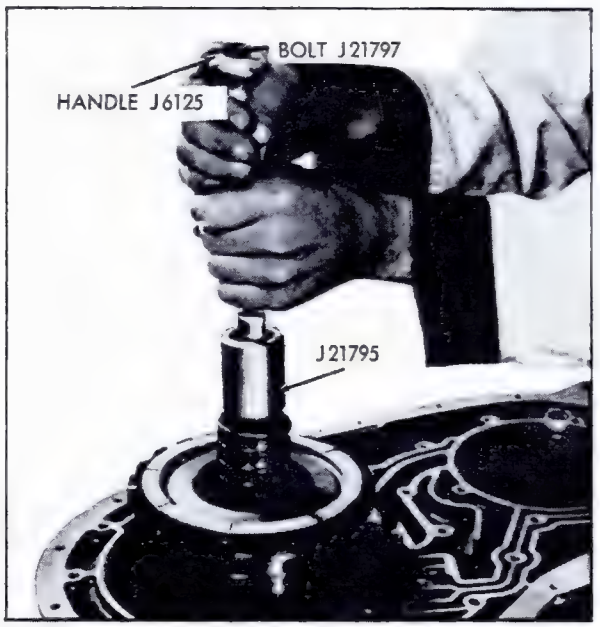


Fig. 7-175 Removing Gear Unit Assembly

J-21797, tighten bolt on tool to secure tool on shaft, Fig. 7-175.

6. Remove complete gear unit assembly from case, by lifting straight up.

CAUTION: Be careful not to drop or bump assembly in transmission case during removal.

7. Remove output flange to case thrust washer from output flange or case.

8. Place gear unit assembly on bench with output flange down. Remove Tool J-21795.

9. Remove rear unit selective washer from transmission case.

10. Remove rear band assembly. To facilitate removal, rotate band lugs away from pins and pull band assembly out of transmission case.

31. Individual Unit Disassembly, Cleaning, Inspection, Assembly and Installation of Major Components

a. Inspection of Transmission Case

1. Inspect case assembly for cracks, porosity or interconnected passages, Fig. 7-142.

2. Check for good retention of band anchor pins.

3. Inspect all threaded holes for thread damage.

4. Inspect intermediate clutch driven plate lugs for damage or brinelling.

5. Inspect snap ring grooves for damage.

6. Inspect governor assembly bore for scratches or scoring.

7. Inspect governor pipes screen assemblies (located in governor pipe holes in case) for plugging or damage.

8. Inspect modulator valve bore for scoring or damage.

9. Inspect output flange bushing for wear, galling and open lubrication groove.

b. Center Support and Gear Unit

1. Disassembly

a. Remove center support assembly from reaction carrier by lifting center support straight up.

b. Remove center support to reaction carrier thrust washer.

NOTE: Thrust washer may have stuck to back of center support. If so, remove from center support.

c. Remove reaction carrier and roller clutch assembly from output carrier, Fig. 7-176, and remove roller clutch assembly from reaction carrier.

d. Remove center support to sun gear races and thrust bearing from sun gear.

NOTE: One of the races may have stuck to back of center support.

e. Remove front internal gear ring from output carrier assembly, Fig. 7-177.

f. Remove sun gear from output carrier assembly.

g. Remove reaction carrier to output carrier plastic thrust washer from output carrier.

h. Invert gear unit and place in Rear Unit Holding Fixture, J-6116, with main shaft pointing downward.

i. Remove snap ring securing output flange to output carrier and remove output flange.

j. Remove thrust bearing and races from rear internal gear.

k. Lift rear internal gear and main shaft out of output carrier and remove thrust bearing and races from inner face of rear internal gear.

l. Remove snap ring from end of main shaft and remove rear internal gear.

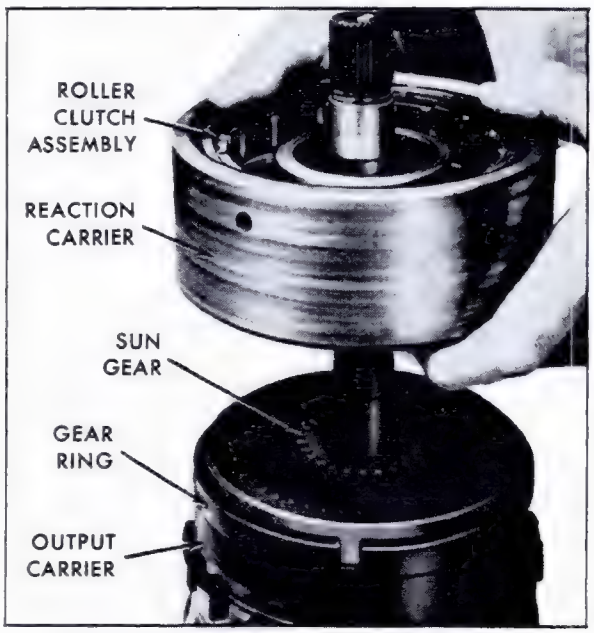


Fig. 7-176 Removing Reaction Carrier and Roller Clutch Assembly

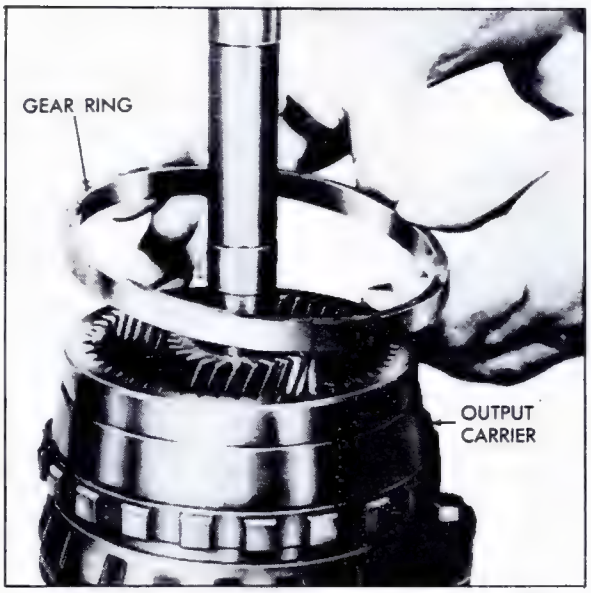


Fig. 7-177 Removing Front Internal Gear Ring

m. Remove output carrier from holding fixture.

2. Inspect Output Flange

a. Inspect bearing and thrust washer surfaces for damage.
b. Inspect drive lugs for damage.
c. Inspect splines for damage.
d. Inspect lubrication passages.

3. Inspect Main Shaft

a. Inspect shaft for cracks or distortion.
b. Inspect splines for damage.
c. Inspect ground bushing journals for damage.
d. Inspect snap ring groove for damage.
e. Inspect orificed cup plug in end of main shaft. Be sure it is not plugged.
f. Inspect lubrication passages.

4. Inspect Rear Internal Gear

a. Inspect gear teeth for damage or wear.
b. Inspect splines for damage.
c. Inspect gear for cracks.
d. Inspect bearing and thrust surfaces for wear or galling.

5. Inspect Output Carrier

a. Inspect front internal gear for damaged teeth.
b. Inspect pinion gears for damage, rough bearings or excessive tilt.
c. Check pinion end play. Pinion end play should be .009 inch - .024 inch, Fig. 7-178.
d. Inspect parking gear lugs for cracks or damage.
e. Inspect output shaft locating splines for damage.
f. Inspect front internal gear ring for flaking or cracks.

6. Inspect Reaction Carrier

a. Inspect band surface on reaction carrier for signs of burning or scoring.

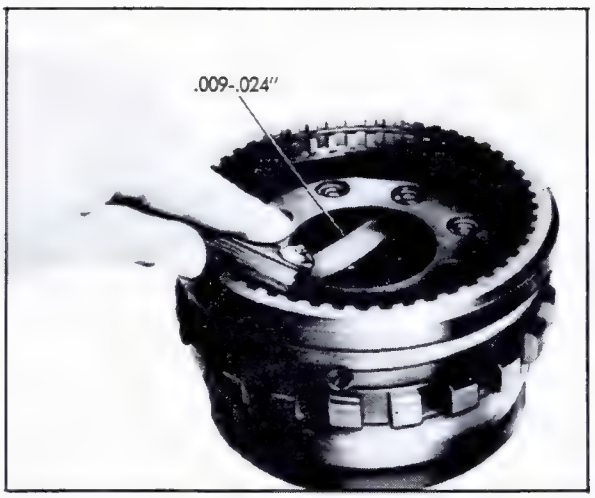


Fig. 7-178 Checking Pinion End Play

b. Inspect roller clutch outer cam for scoring or wear.
c. Inspect thrust washer surfaces for signs of scoring or wear.
d. Inspect bushing for damage. If bushing is damaged, carrier must be replaced.
e. Inspect pinion gears for damage, rough bearings or excessive tilt.
f. Check pinion end play. Pinion end play should be .009 inch - .024 inch.

7. Pinion Gear Replacement - Reaction and Output Carrier Assemblies

a. Support carrier assembly on its FRONT face.
b. Using a 1/2 inch diameter drill, remove the stake marks from the end of the pinion pin, or pins, to be replaced. This will reduce the probability of cracking the carrier when the pinion pins are pressed out.

CAUTION: Do not allow drill to remove any stock from the carrier, as this will weaken the part, resulting in probable future failure of it.

c. Using a tapered punch, drive or press pinion pins out of carrier.
d. Remove pinion gears, thrust washers, and roller needle bearings.
e. Inspect pinion pocket thrust faces for burrs and remove if present.
f. Install eighteen needle bearings into each pinion gear using petrolatum to hold bearings in place. Use a pinion pin as a guide.
g. Place a bronze and steel thrust washer on each side of pinion gear with steel washers against gear, Fig. 7-179. Hold washers in place with petrolatum.
h. Place pinion gear assembly in position in carrier and install a pilot shaft through rear face of assembly to hold parts in place.
i. Drive a new pinion pin into place from the front, while rotating pinion gear. Be sure that headed end is flush or below face of carrier.

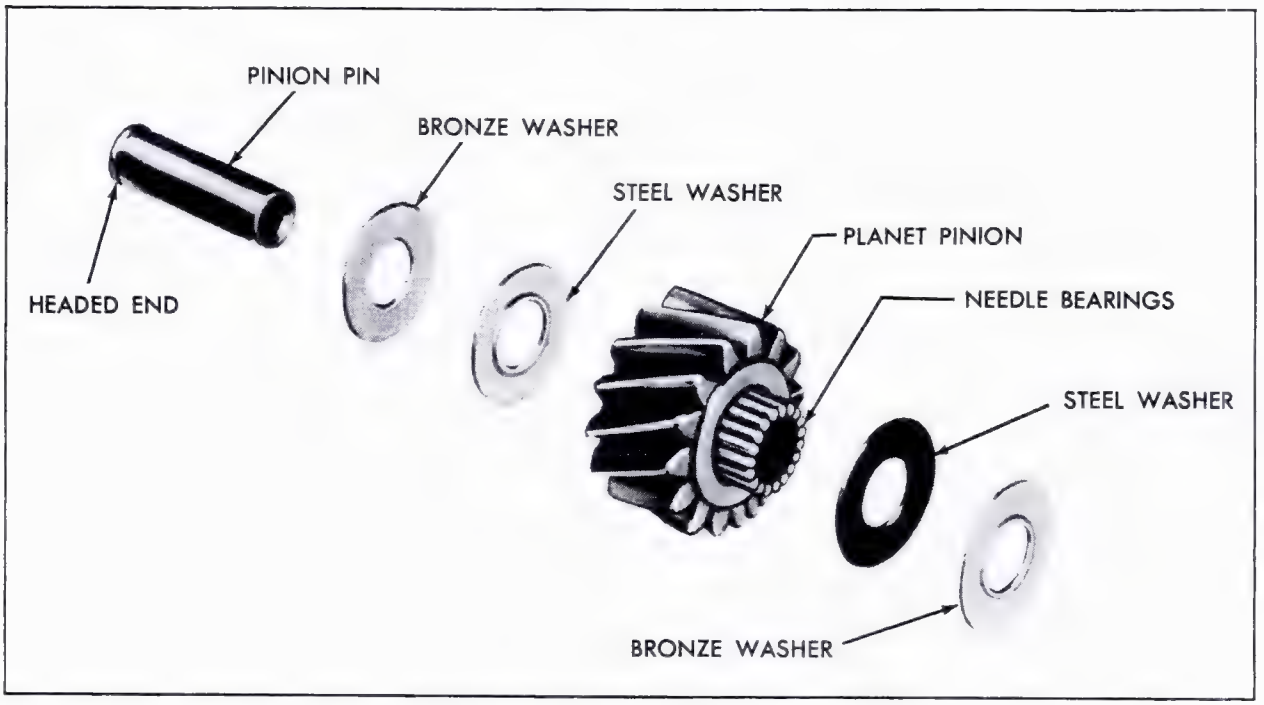


Fig. 7-179 Planet Pinion Assembly Disassembled

j. Using a punch in bench vise for an anvil, stake opposite end of pinion pin in three places with a blunt radius chisel, Fig. 7-180.

NOTE: Both ends of pinion pins must lie below face of carrier or interference may occur.

k. Repeat installation procedure for each pinion gear.

8. Inspect roller clutch

a. Inspect roller clutch for damaged rollers or springs.

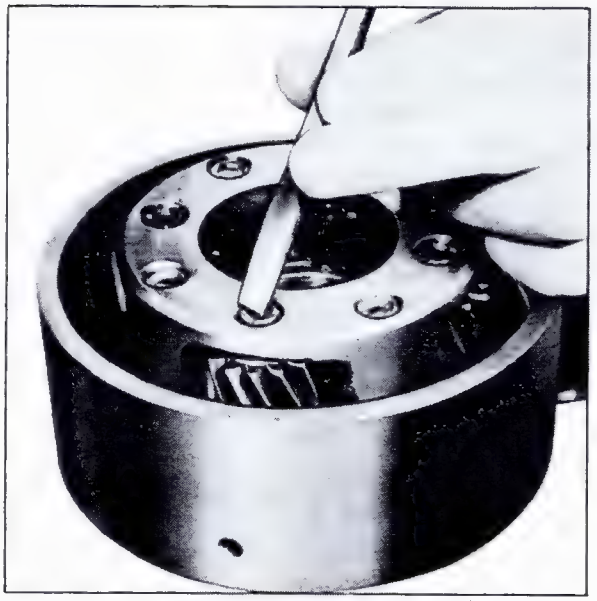


Fig. 7-180 Staking Pinion Pin

b. Inspect roller clutch cage for damage.

9. Inspect Sun Gear

a. Inspect gear teeth for damage or wear.
b. Inspect splines for damage.
c. Be sure oil lubrication hole is open.

10. Inspect sun gear shaft

a. Inspect shaft for cracks or splits.
b. Inspect splines for damage.
c. Inspect bushings for scoring or galling.
d. Inspect ground bushing journals for damage.
e. Be sure oil lubrication hole is open.

11. Assemble Gear Unit (Fig. 7-181)

a. Install rear internal gear on end of main shaft that has snap ring groove and install snap ring.

b. Install races and thrust bearing on inner face of rear internal gear, retaining races and bearing with petrolatum. Proceed as follows:
1. Install large diameter race first, with flange facing up, Fig. 7-182.
2. Install thrust bearing in race.
3. Install small diameter race on bearing with inner flange facing down.

c. Lubricate pinion gears in output carrier with transmission fluid and install output carrier on main shaft so that pinion gears mesh with rear internal gear.

d. Place assembly in Rear Unit Holding Fixture, J-6116, with main shaft pointing downward. Be careful not to damage shaft.

e. Install races and thrust bearing on outer face of rear internal gear, retaining races and bearing with petrolatum. Proceed as follows:

1. Install small diameter (flanged I.D.) race first, with flange facing up, Fig. 7-183.
2. Install thrust bearing in race.
3. Install large diameter (flanged O.D.) race on bearing with flange cupped over bearing.

f. Install output flange into output carrier and install snap ring.

CAUTION: The 1969 output flange to output carrier snap ring is flat and thinner than pre-1969 snap rings. The change in design of the 1969 snap ring required a change in the groove of the output carrier. The flat snap ring and pre-1969 snap ring (one side is beveled) are not interchangeable.

g. Invert assembly and place on bench with output flange downward.

h. Lubricate tab side of reaction carrier to output carrier thrust washer with petrolatum and install thrust washer in output carrier with tabs in tab pockets.

i. Install sun gear with end having chamfered I.D. facing down.

j. Install sun gear shaft with longer splined end down.

k. Install gear ring over output carrier.

l. Lubricate pinion gears in reaction carrier with transmission fluid and install reaction carrier on output carrier so that pinion gears mesh with front internal gear.

NOTE: When a new output carrier and/or reaction carrier is being installed, and if the front internal gear ring prevents assembly of the carriers, replace the front internal gear ring with the service ring. The front internal gear ring is a selective fit at the factory, but not in service.

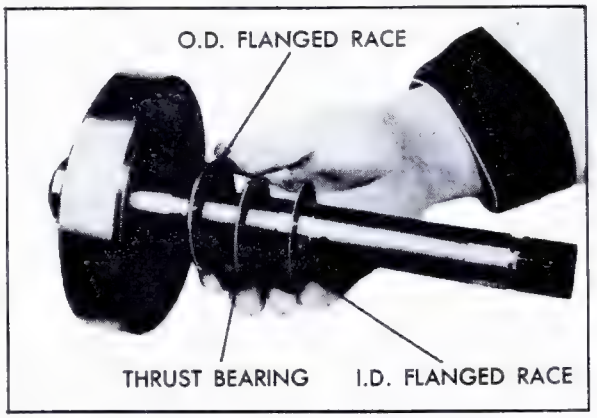


Fig. 7-182 Installing Races and Thrust Bearing on Inner Face of Rear Internal Gear

m. Install large diameter O.D. race on sun gear with flange facing up against sun gear shaft.

n. Install thrust bearing on race.

o. Lubricate small diameter race with petrolatum and install race on center support with flange facing toward tower end, Fig. 7-184.

p. Install rollers that may have come out of roller clutch cage, by compressing energizing spring with forefinger and inserting roller from outer side, Fig. 7-185.

NOTE: Make certain that energizing springs are not distorted, and that curved end leaf of springs are positioned against rollers.

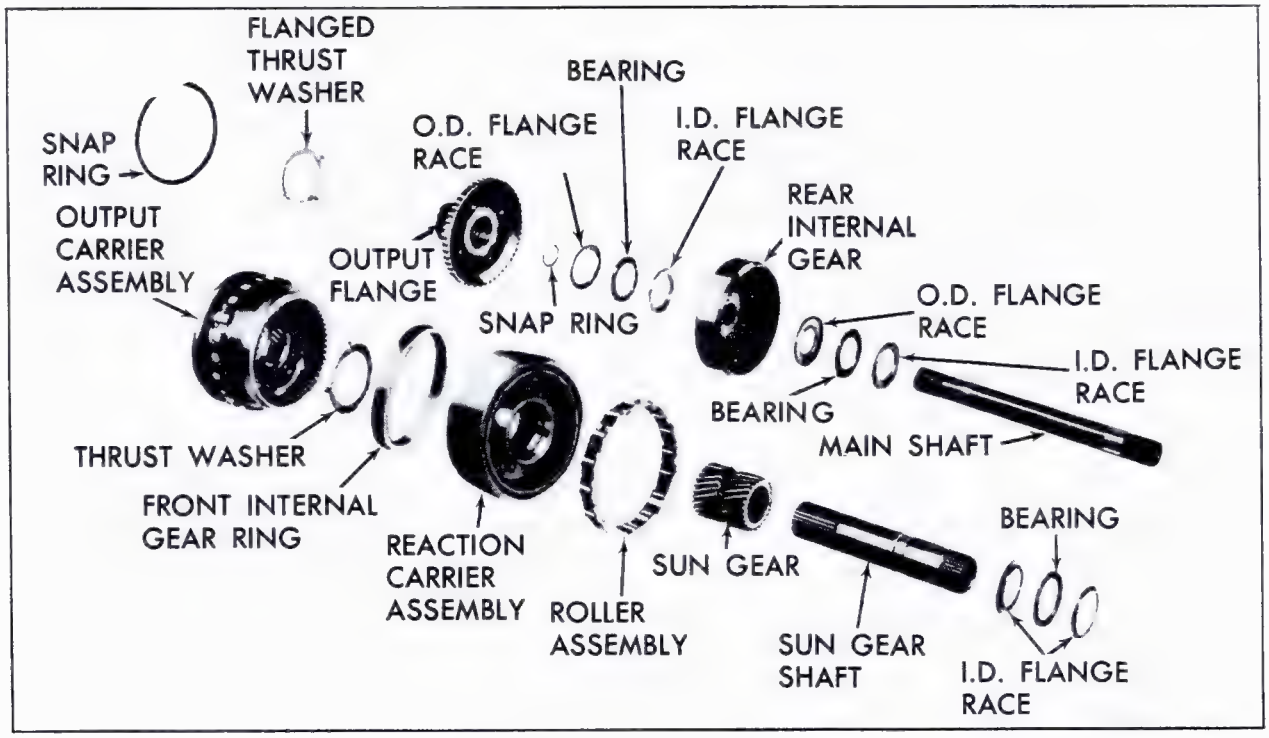


Fig. 7-181 Gear Unit Assembly Disassembled

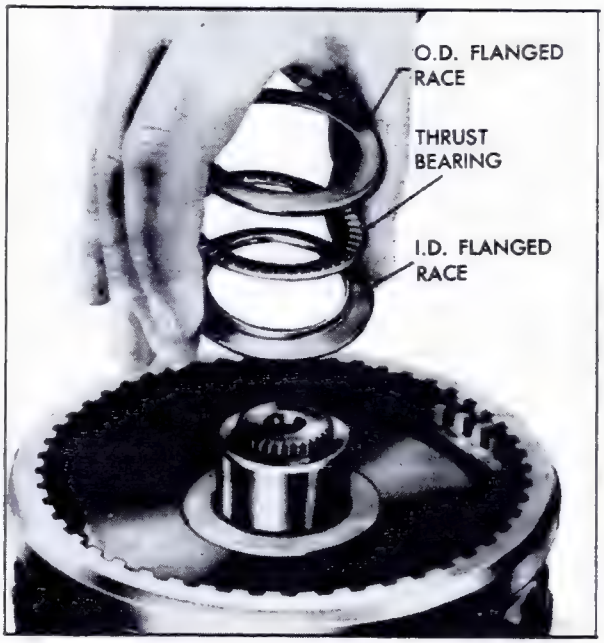


Fig. 7-183 Installing Races and Thrust Bearing on Outer Face of Rear Internal Gear

q. Install roller clutch assembly in reaction carrier, Fig. 7-186.

12. Disassemble Center Support and Intermediate Clutch Piston

a. Remove center support to reaction carrier phenolic thrust washer from recess in center support.

b. Remove four hook type oil seal rings from center support.

c. Using Clutch Spring Compressor, J-4670, and Rear Clutch Spring Compressor, J-6129, Fig. 7-187, compress spring retainer and remove snap ring with Snap Ring Pliers, J-8059 or J-5586.

Fig. 7-184 Installing Races and Thrust Bearing over Sun Gear Shaft

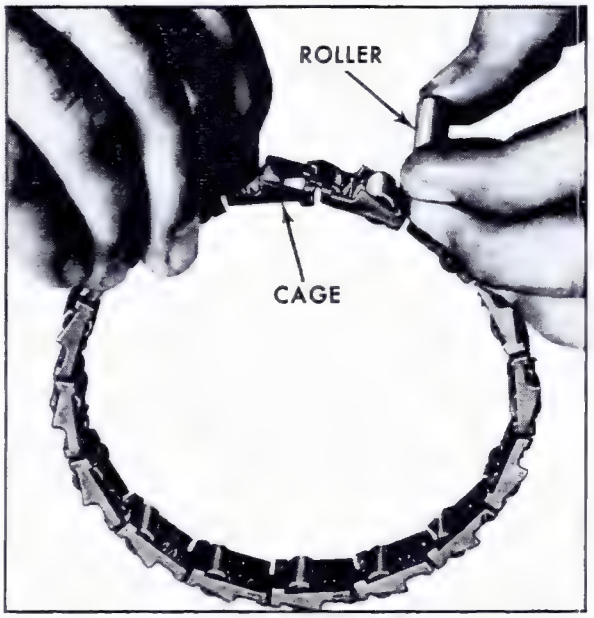


Fig. 7-185 Installing Roller in Roller Clutch Cage

d. Remove tools, spring retainer, and twelve intermediate clutch release springs.

e. Remove intermediate clutch piston from center support.

f. Remove inner and outer seals from clutch piston.

NOTE: Do not remove the three screws retaining roller clutch inner race to center support.

13. Inspect Center Support

a. Inspect roller clutch inner race for scratches or indentations. Be sure lubrication hole is open.

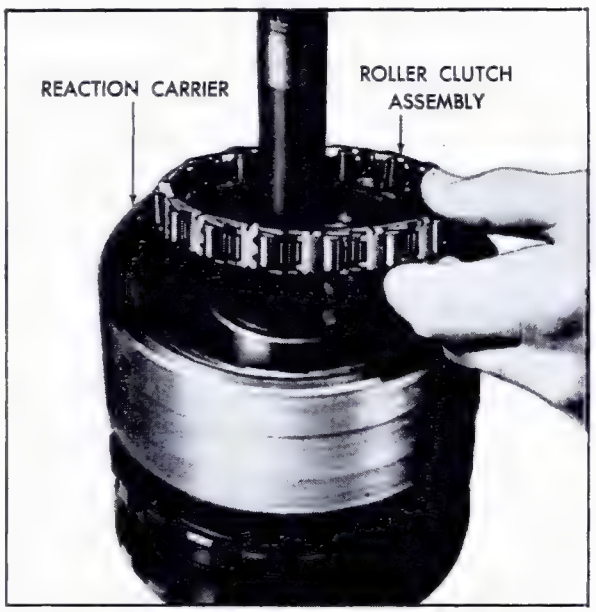


Fig. 7-186 Installing Roller Clutch Assembly in Reaction Carrier

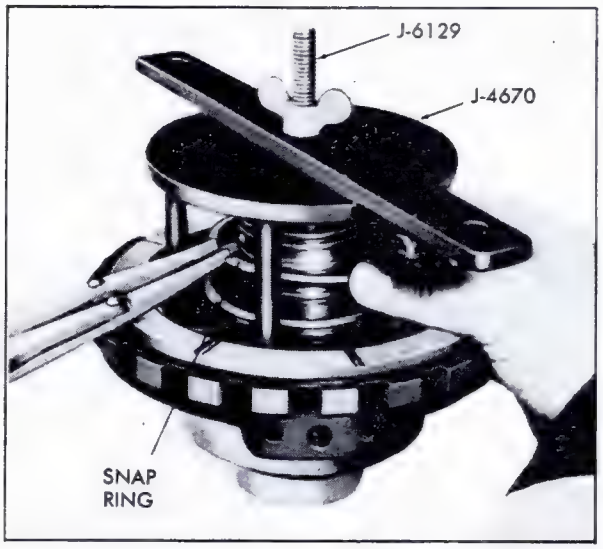


Fig. 7-187 Removing and Installing Intermediate Clutch Piston Snap Rings

b. Inspect bushing for scoring, wear or galling.
c. Check oil ring grooves for damage.
d. Air check oil passages to be sure they are open and not interconnected.
e. Inspect piston sealing surfaces for scratches.
f. Inspect piston seal grooves for nicks or other damage.
g. Inspect piston for cracks or porosity.
h. Inspect springs for collapsed coils or signs of distortion.

14. Assemble Center Support and Intermediate Clutch Piston Assembly (Fig. 7-188)

a. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in intermediate clutch piston and install seals with lips facing away from spring pockets.
b. Place Intermediate Clutch Inner Seal Protector, J-21363, over center support hub, Fig. 7-189, and install intermediate clutch piston.
c. Install twelve clutch release springs into spring pockets in clutch piston.
d. Place spring retainer and snap ring over springs.
e. Using Clutch Spring Compressor, J-4670, and Rear Clutch Spring Compressor, J-6129, Fig. 7-187, compress spring retainer, being careful that retainer does not get caught in snap ring groove, and install snap ring with Snap Ring Pliers, J-8059 or J-5586. Remove tools.
f. Install four new oil seal rings on center support.
g. Air check operation of intermediate clutch piston. Apply air through center oil feed hole to actuate clutch piston, Fig. 7-190.
h. Lubricate phenolic center support to reaction carrier thrust washer with petrolatum and install washer in recess of center support, Fig. 7-191. Check to make sure sun gear thrust bearing race is on center support.
i. Install center support assembly into roller clutch in reaction carrier, Fig. 7-192.

NOTE: With reaction carrier held, center support should turn clockwise only.

j. Install Gear Assembly Remover and Installer Adapter, J-21795, on end of main shaft so that tangs engage groove in shaft. Using Slide Hammer Handle, J-6125, and Speedometer Puller Bolt, J-21797, tighten bolt on tool to secure tool on shaft and prevent movement of the roller clutch

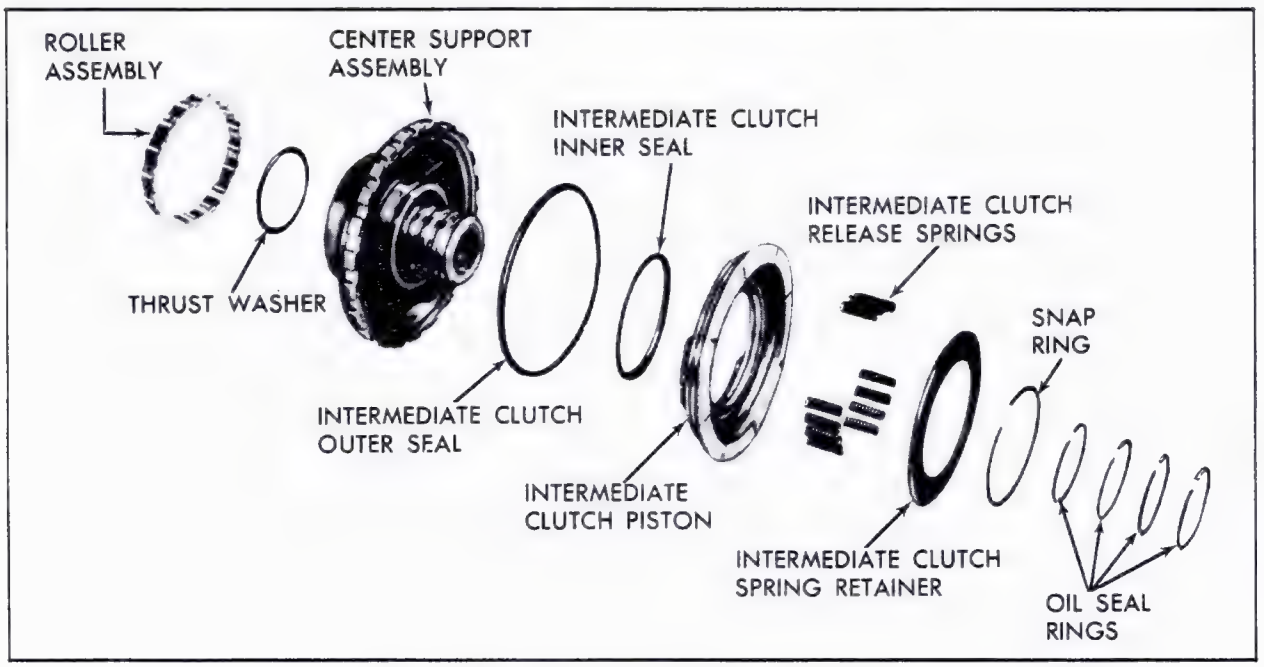


Fig. 7-188 Case Support Assembly Disassembled

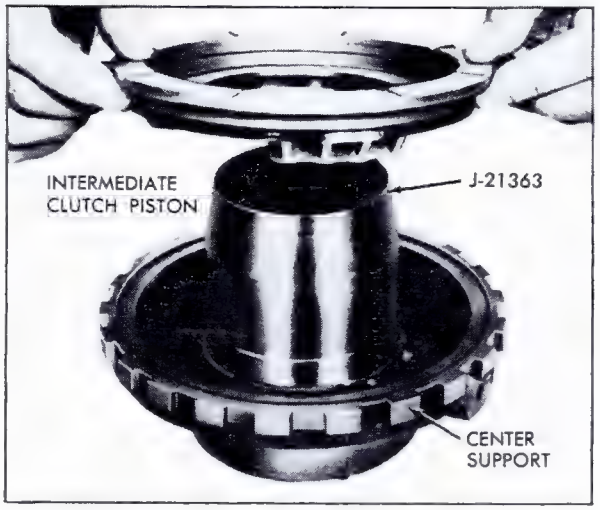


Fig. 7-189 Installing Intermediate Clutch Piston

during installation of the gear unit assembly, Fig. 7-175.

15. Install Rear Band and Complete Gear Unit Assembly

a. Inspect rear band for cracks or distortion and band ends for damage to anchor lugs and apply lug. Also inspect lining for cracks, flaking, burning and looseness.

b. Install rear band assembly in transmission case so that band lugs index with anchor pins.

c. Install previously selected rear unit selective washer into slots provided inside rear of transmission case. Retain washer with petrolatum.

NOTE: Proper washer size was determined at time of rear unit end play check.

d. Laying gear unit on its side, install thrust washer on output flange with bent tabs in tab pockets. Retain thrust washer with petrolatum.

CAUTION: Be careful not to drop or bump gear unit assembly in transmission case during installation.

e. Lubricate center support to case snap ring with transmission fluid and install snap ring in

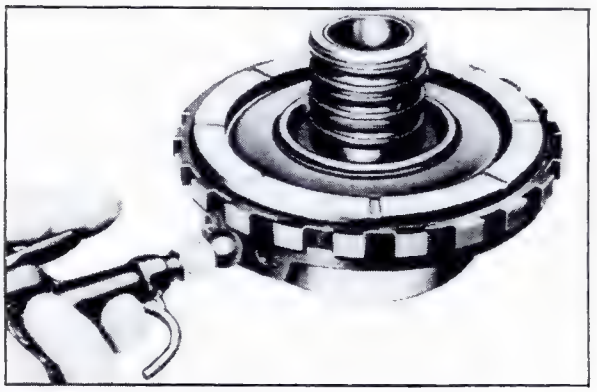


Fig. 7-190 Air Checking Intermediate Clutch

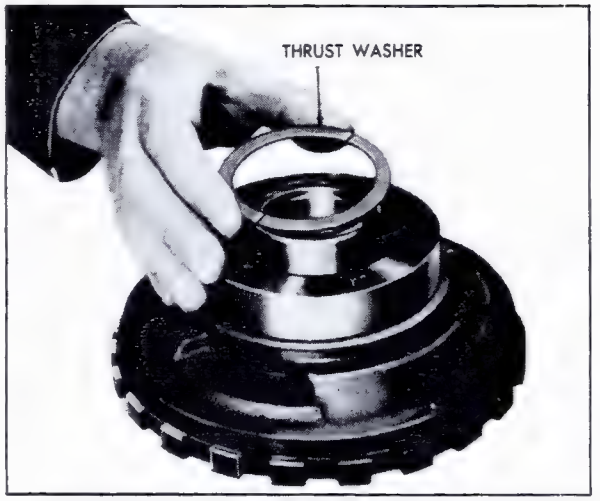


Fig. 7-191 Installing Center Support to Reaction Carrier Thrust Washer

transmission case with beveled side up, locating gap adjacent to front band anchor pin. Expand snap ring until center support is against shoulder of case.

f. Install gear unit, with center support and reaction carrier, by lining up center support bolt hole with hole in case and carefully guiding complete assembly into transmission case.

g. Install case to center support screw.

NOTE: To correctly perform this operation, it will be necessary to make the tool as described in NOTE 18b, step 9, first three paragraphs. Then follow procedure outlined below.

Place center support locating tool into the case direct clutch passage, with the handle of the tool pointing to the left, as viewed from the front of

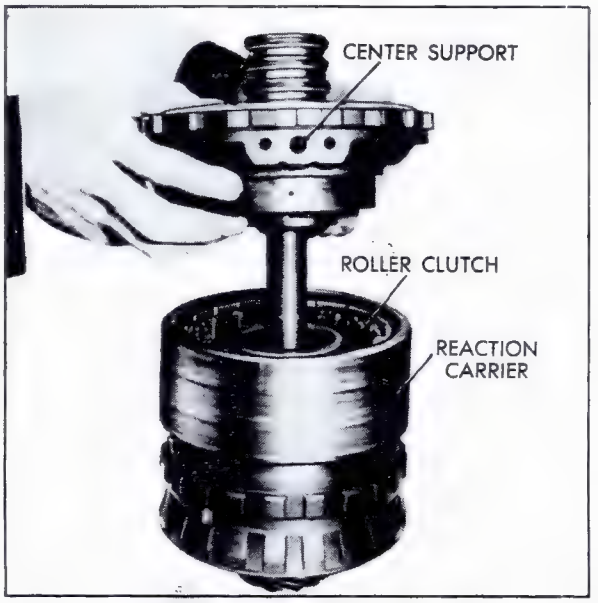


Fig. 7-192 Installing Center Support in Reaction Carrier

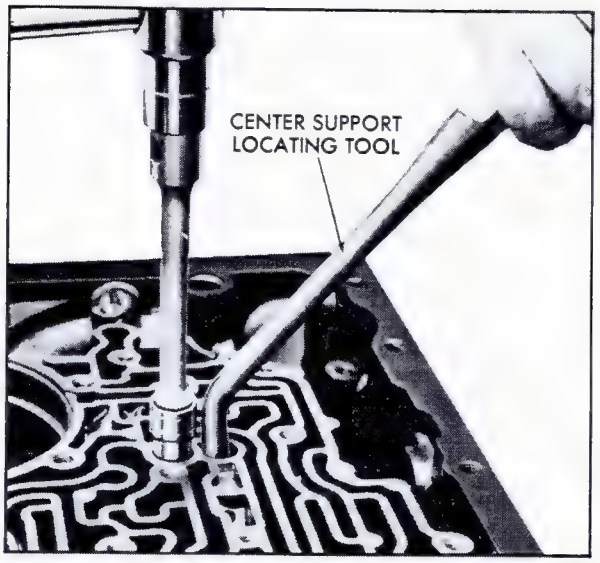


Fig. 7-193 Locating Center Support

transmission and parallel to the bell housing mounting, Fig. 7-193.

Lift upward on the tool which will tend to rotate the center support counterclockwise as viewed from the front of transmission. While holding the center support firmly counterclockwise against case splines, torque case to center support to 23 ft. lbs., using a 3/8" 12-point thin-wall deep socket.

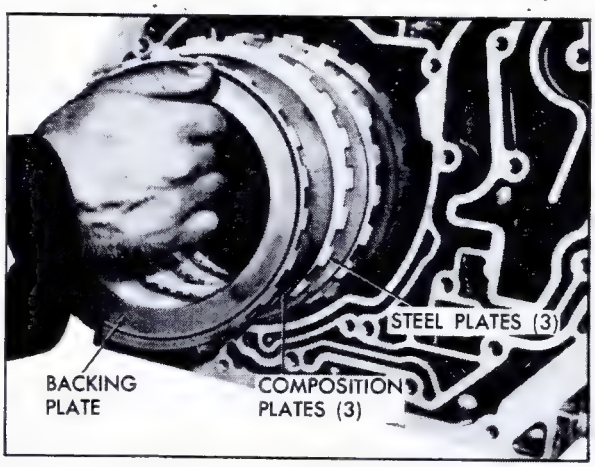


Fig. 7-194 Installing Intermediate Clutch Plates

CAUTION: When using the locating tool, care should be taken not to raise burrs on the case valve mounting face.

h. Before installing intermediate clutch plates, inspect plates for signs of burning, scoring, and wear.

i. Lubricate three steel and three composition intermediate clutch plates with transmission fluid and install clutch plates in transmission case, Fig. 7-194. Start with steel plate and alternate composition and steel plates.

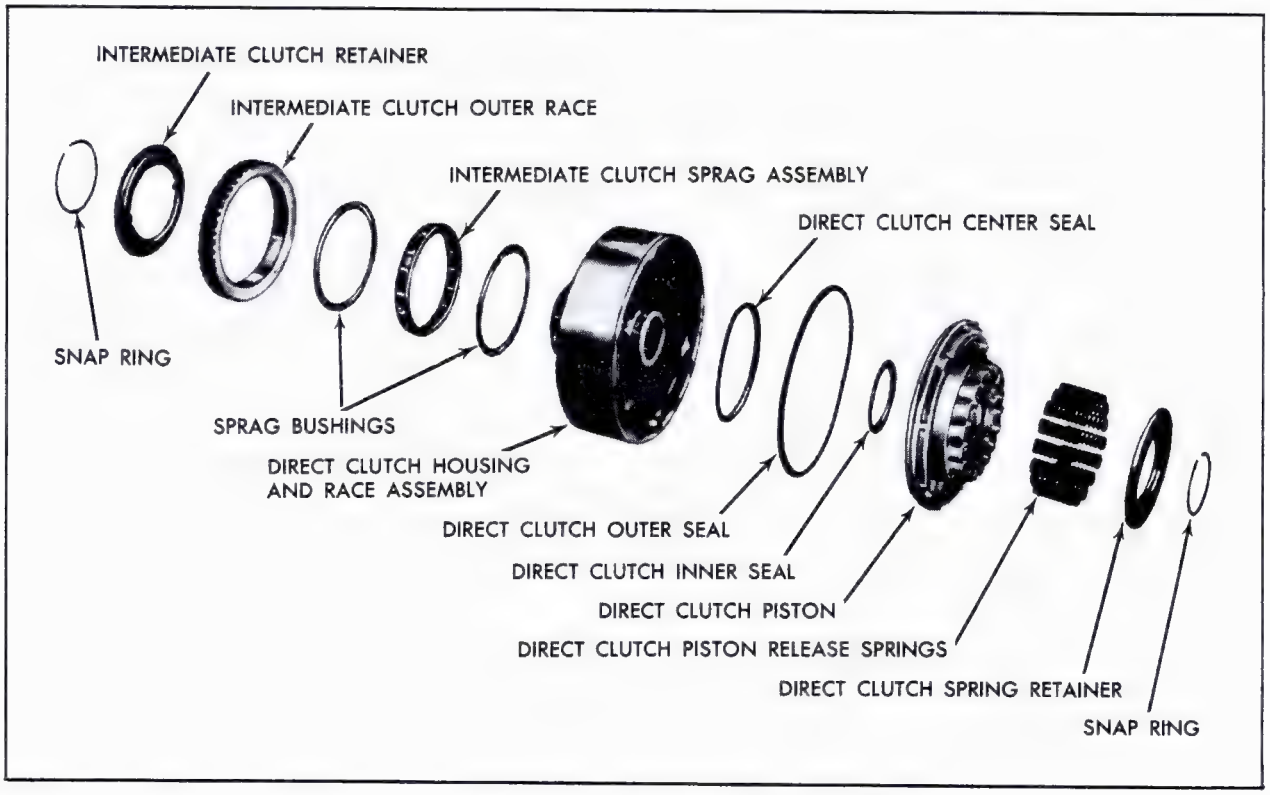


Fig. 7-195 Direct Clutch and Piston Disassembled

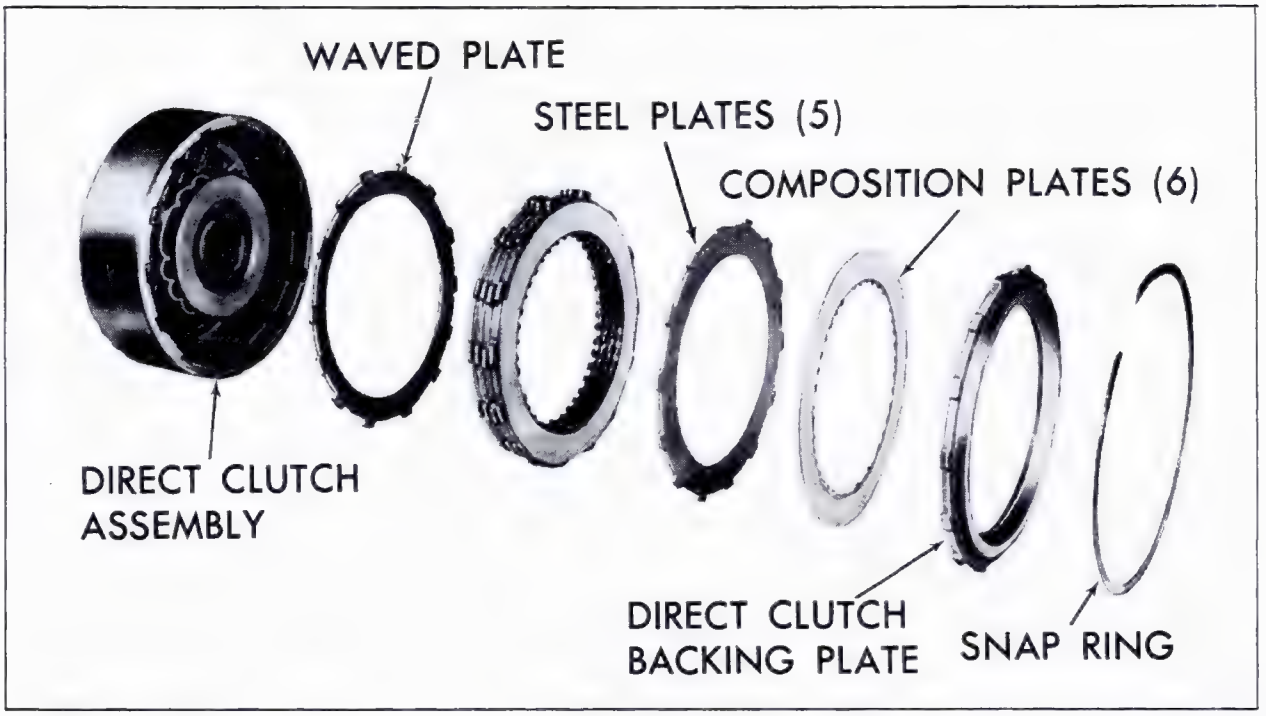


Fig. 7-196 Direct Clutch Disassembled

j. Install intermediate clutch backing plate with flat machined surface against clutch plates.

k. Install backing plate to case snap ring with snap ring gap on side of case opposite front band anchor pin.

NOTE: Both sides of this snap ring are flat.

1. Recheck rear unit end play as described in Note 30r.

c. Direct Clutch and Intermediate Sprag Assembly (Fig. 7-195)

1. Disassembly

a. Remove sprag retainer snap ring, and remove clutch retainer.

b. Remove sprag outer race and bushings, and remove sprag assembly from outer race.

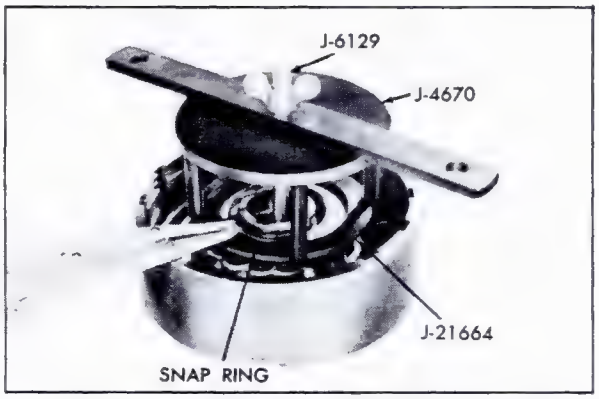


Fig. 7-197 Removing and Installing Direct Clutch Housing Snap Ring

c. Turn unit over and remove direct clutch backing plate to clutch housing snap ring.

d. Remove direct clutch backing plate and six composition and six steel clutch plates, Fig. 7-196.

e. Using Clutch Spring Compressor, J-4670, Rear Clutch Spring Compressor, J-6129, or an arbor press, and Adapter, J-21664, Fig. 7-197. compress spring retainer and remove snap ring with Snap Ring Pliers, J-8059 or J-5586.

f. Remove tools, spring retainers, and sixteen clutch release springs.

g. Remove direct clutch piston from direct clutch housing.

h. Remove inner and outer seals from clutch piston.

i. Remove center piston seal from direct clutch housing.

2. Inspection

a. Inspect sprag assembly for popped or loose sprags.

b. Inspect sprag bushing for wear or distortion.

c. Inspect inner and outer races for scratches or wear.

d. Inspect clutch housing for cracks, wear, proper openings of oil passages and wear on clutch plate drive lugs.

e. Inspect composition faced and steel clutch plates for sign of wear or burning.

f. Inspect backing plate for scratches or other damage.

g. Inspect piston for cracks and free operation of ball check.

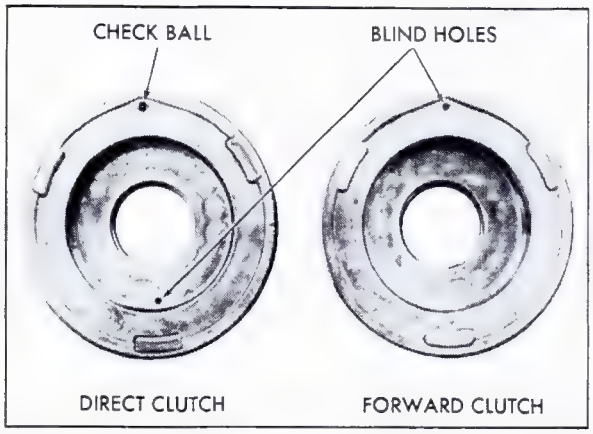


Fig. 7-198 Direct Clutch Identification

h. Inspect springs for collapsed coils or signs of distortion.

3. Assembly

a. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in direct clutch piston and install seals with lips facing away from spring pockets.

NOTE: Make certain piston has ball check, Fig. 7-198.

b. Lubricate new center seal with transmission fluid. Lubricate seal groove in direct clutch housing and install seal in clutch housing with lip facing up.

c. Place Forward and Direct Clutch Inner Seal Protector, J-21362, over direct clutch hub. Install clutch piston inside Forward and Direct Clutch Piston Installer, J-21409, insert assembly in direct clutch housing, Fig. 7-199, and install clutch piston by rotating it slightly, in a clockwise direction.

d. Install 16 clutch release springs into spring pockets in clutch piston.

NOTE: Direct clutch release springs are red in color and are not interchangeable with the green colored springs used in the forward clutch piston.

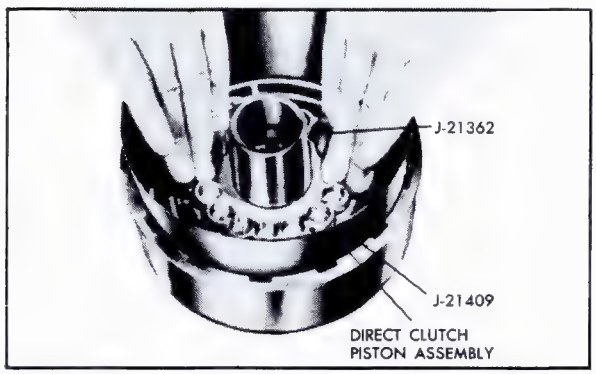


Fig. 7-199 Installing Direct Clutch Piston

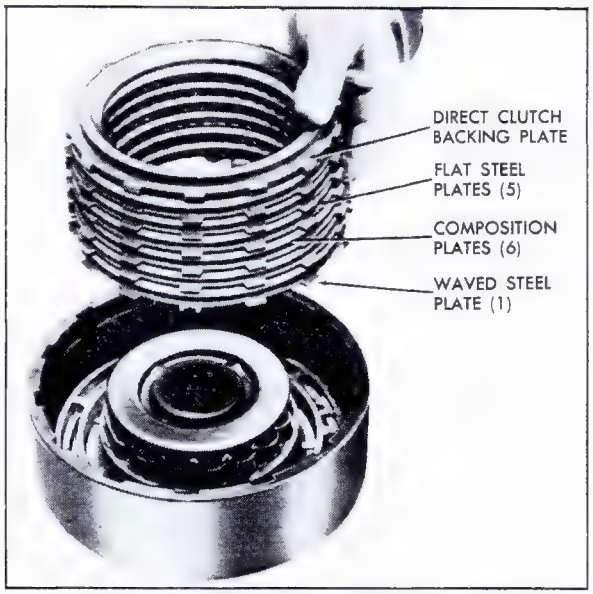


Fig. 7-200 Installing Direct Clutch Plates

e. Place spring retainer and snap ring over springs.

f. Using Clutch Spring Compressor, J-4670, Rear Clutch Spring Compressor, J-6129, or an arbor press, and Adapter, J-21664, Fig. 7-196, compress spring retainer, being careful that retainer does not get caught in snap ring groove, and install snap ring with Snap Ring Pliers, J-8059 or J-5586. Remove tools.

NOTE: Make certain clutch release springs are not leaning. If necessary, straighten springs with a small screwdriver.

g. Lubricate the five flat and one waved (plate with "U" notch) steel and six composition clutch plates with transmission fluid and install clutch plates in direct clutch housing. Start with waved steel plate and alternate composition and flat steel clutch plates, Fig. 7-200.

h. Install direct clutch backing plate over clutch plates and install backing plate snap ring.

i. Invert clutch housing and install one sprag bushing, cup side up, around sprag inner race.

j. Install sprag assembly into clutch outer race.

k. With ridge on inner cage of sprag facing up, install sprag and outer race on inner race with counterclockwise turning motion.

NOTE: When installed, outer race should turn only counterclockwise, Fig. 7-201.

l. Install sprag bushing, cup side down, over sprag assembly.

m. Install sprag retainer and snap ring.

4. Install Front Band and Direct Clutch Assembly

a. Inspect front band for cracks or distortion and band ends for damage at anchor lug and apply

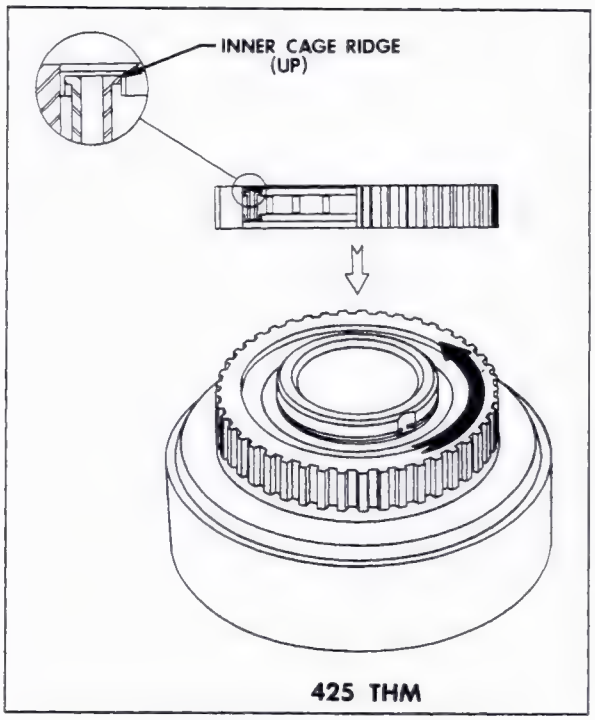


Fig. 7-201 Sprag Rotation

lug. Also inspect lining for cracks, flaking, burning, and looseness.

b. Install front band with band anchor hole over band anchor pin, and apply lug facing servo hole, Fig. 7-202.

c. Install direct clutch housing and intermediate sprag assembly. Make certain that clutch housing hub bottoms on sun gear shaft and splines on forward end of sun gear shaft are flush with splines in direct clutch housing.

NOTE: It will be necessary to rotate clutch housing to allow sprag outer race to index with intermediate composition clutch plates. Removal of direct clutch composition-faced and steel plates may be helpful and applying air pressure through the center support screw to apply the intermediate clutch plates may facilitate assembly

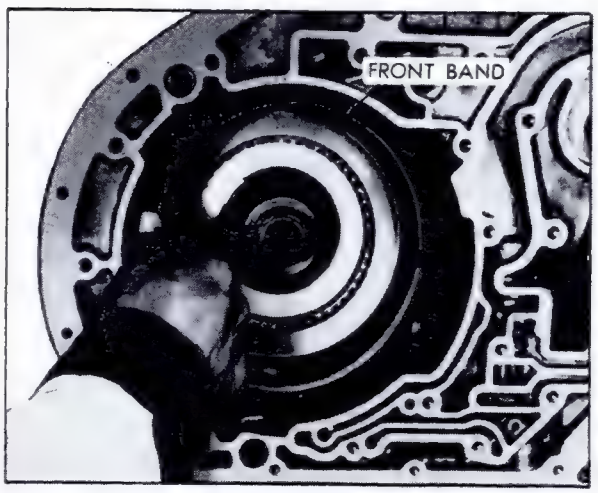


Fig. 7-202 Installing Front Band

d. Check operation of direct clutch by applying air pressure through direct clutch passage next to center support bolt, Fig. 7-141.

d. Forward Clutch Assembly

1. Disassembly (Fig. 7-203)

a. Remove forward clutch housing to direct clutch hub snap ring.

b. Remove direct clutch hub.

c. Remove forward clutch hub and thrust washer from inner side of hub.

d. Remove five radially grooved composition and five flat and one dished steel clutch plates.

e. Using Clutch Spring Compressor, J-4670, and Adapter, J-21664, compress spring retainer with arbor press and remove snap ring using Snap Ring Pliers, J-8059 or J-5586, Fig. 7-204.

f. Remove tools, spring retainer and 16 clutch release springs.

g. Remove forward clutch piston from forward clutch housing.

h. Remove inner and outer seals from clutch piston.

i. Remove center piston seal from forward clutch housing.

2. Inspection

a. Inspect composition-faced and steel clutch plates for signs of burning, scoring or wear.

b. Inspect sixteen release springs for collapsed coils or signs of distortion.

c. Inspect clutch hubs for worn splines, proper lubrication holes, and thrust faces.

d. Inspect piston for cracks.

e. Inspect clutch housing for wear, scoring, cracks and open oil passages.

3. Assembly (Fig. 7-205)

a. Lubricate new inner and outer clutch piston seals with transmission fluid. Lubricate seal grooves in forward clutch piston with petrolatum and install seals with lips facing away from spring pockets.

NOTE: The forward and direct clutch pistons have identical inside and outside diameters. Therefore, extreme care should be exercised during reassembly to assure the proper piston be installed in the clutch assemblies. The forward clutch piston can be identified by the absence of a check ball in the clutch apply face of the piston, Fig. 7-197.

b. Lubricate new center piston seal with transmission fluid. Lubricate seal groove in forward clutch housing with petrolatum and install seal into clutch housing with lip facing up.

c. Place Forward and Direct Clutch Inner Seal Protector, J-21362, over forward clutch hub. Install clutch piston inside Forward and Direct

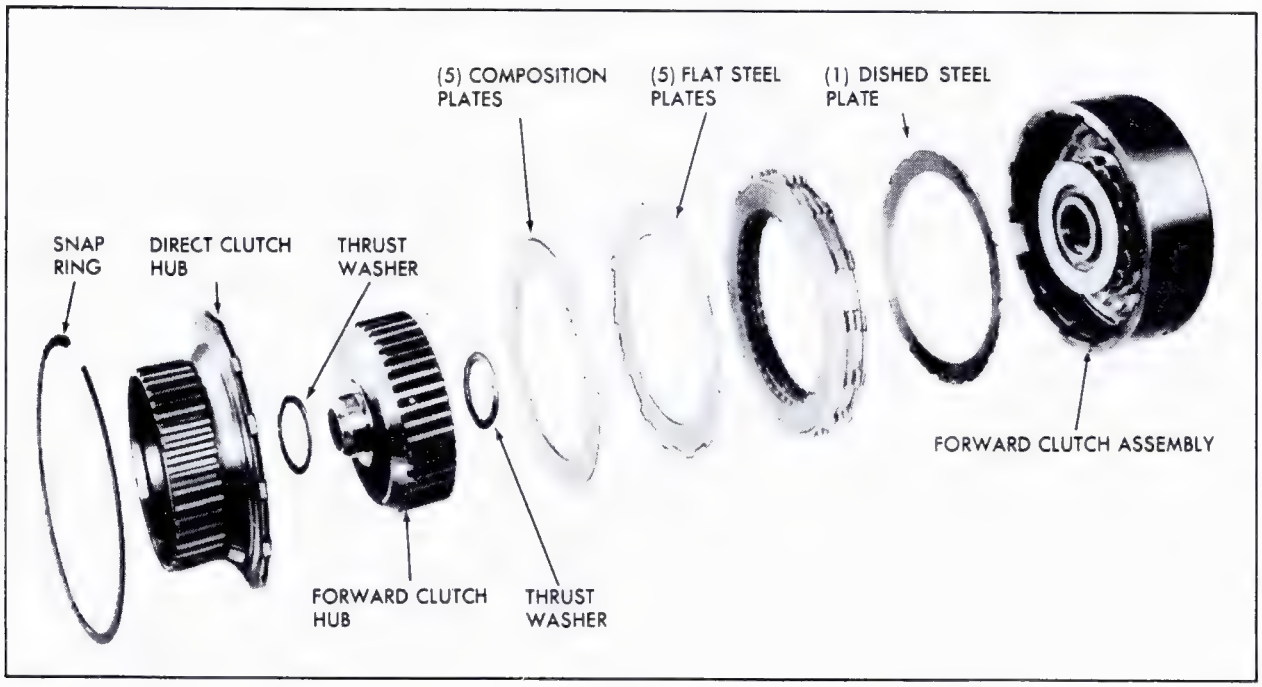


Fig. 7-203 Forward Clutch and Forward and Direct Clutch Hubs Disassembled

Clutch Piston Installer, J-21409, insert assembly in forward clutch housing, Fig. 7-206, and install clutch piston by rotating it slightly in a clockwise direction until seated.

d. Install sixteen clutch release springs into spring pockets in clutch piston.

NOTE: Forward clutch release springs are dyed green and are not interchangeable with the red colored springs used in the direct clutch piston.

e. Using Clutch Spring Compressor, J-4670, and Adapter, J-21664, compress spring retainer with arbor press, being careful that retainer does not catch in snap ring groove, and install snap ring using Snap Ring Pliers, J-8059 or J-5586, Fig. 7-204, and remove tools.

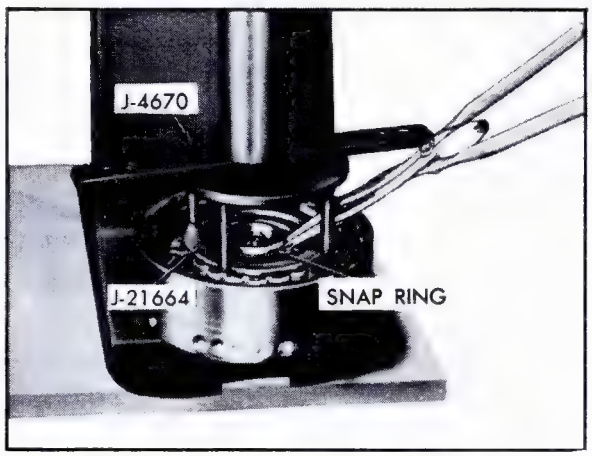


Fig. 7-204 Removing and Installing Forward Clutch Housing Snap Ring

CAUTION: Make certain clutch release springs are not leaning. If necessary, straighten with a small screwdriver.

f. Remove forward clutch assembly from arbor press and place on work bench.

g. Install bronze thrust washer on the inside of forward clutch hub.

h. Install forward clutch hub in forward clutch housing.

i. Lubricate the dished and five flat steel and five radially grooved composition clutch plates with transmission fluid and install clutch plates in forward clutch housing. Start with dished steel plate (O.D. up) and place a flat steel plate on top of the dished steel. Then alternate composition and flat steel clutch plates.

NOTE: Radially grooved plates are installed at the factory only. All service composition plates have the smooth surface configuration.

j. Install direct clutch hub in forward clutch housing over clutch plates, and install snap ring.

k. Air check forward clutch and piston operation, Fig. 7-207.

4. Install Forward Clutch

a. Install Front Unit End Play Checking Tool, J-22241 into forward clutch, Fig. 7-171.

b. Install forward clutch assembly into transmission, making certain main shaft goes into forward clutch hub. It will be necessary to rotate clutch housing to allow direct clutch driving hub to index with direct clutch composition-faced plates.

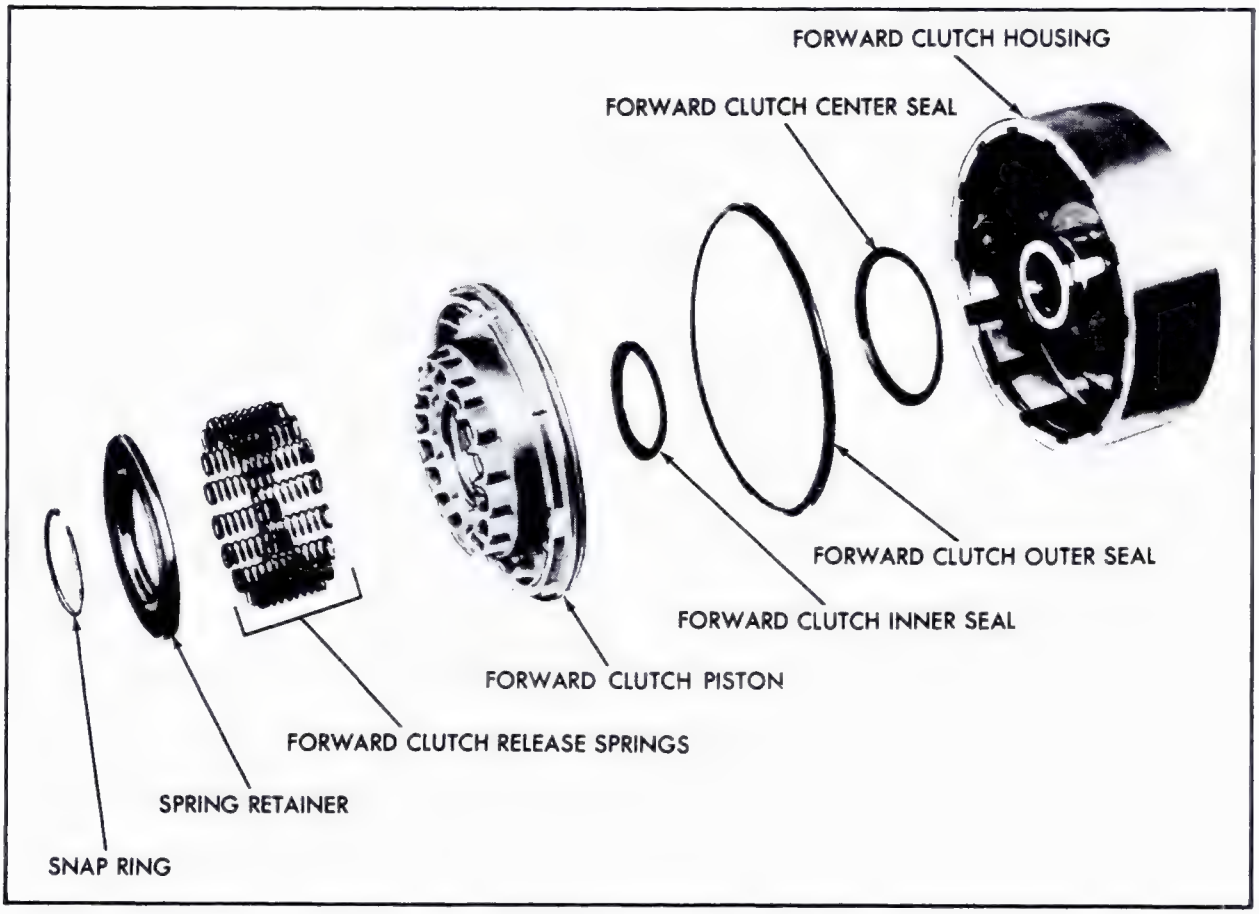


Fig. 7-205 Forward Clutch Disassembled

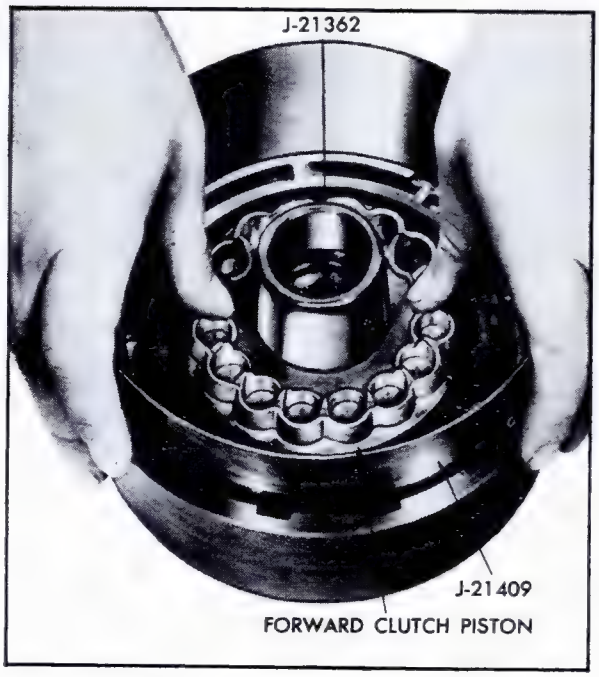


Fig. 7-206 Installing Forward Clutch Piston

c. Remove Front Unit End Play Checking Tool, J-22241.

e. Install Pump Cover Plate

1. Install new pump cover plate gasket on transmission.
2. Install pump cover plate on transmission and install attaching bolts per bolt chart, Fig. 7-208.

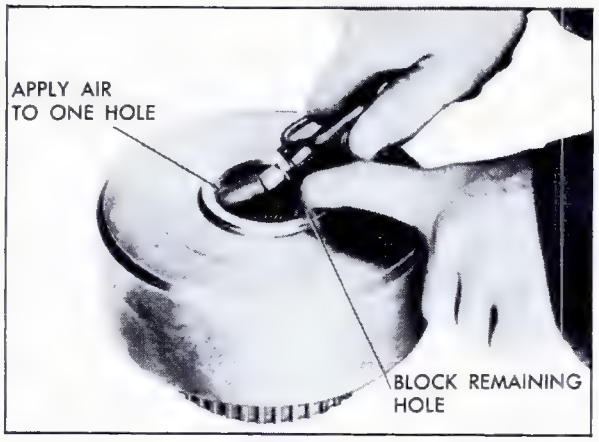


Fig. 7-207 Air Checking Forward Clutch

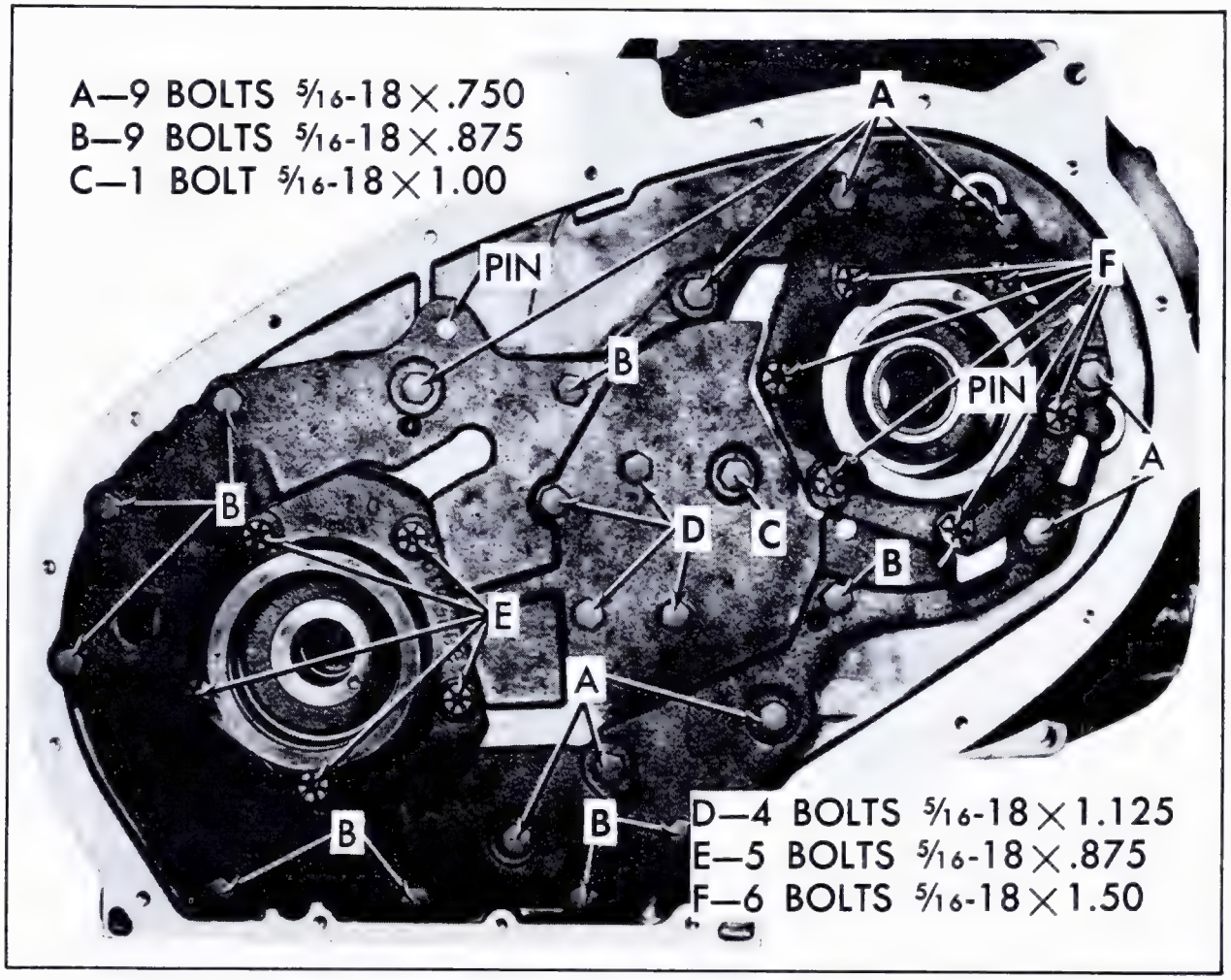


Fig. 7-208 Pump Cover Plate Bolt Chart

NOTE: Do not install pump attaching bolts (F) or single bolt (E) in pump cover plate at this time.

3. Using the driven sprocket as a driver rotate the forward clutch.

NOTE: If the forward clutch housing cannot be rotated as the pump cover plate is being pulled into place, the forward or direct clutch housings have not been properly installed to index with all the clutch plates. This condition must be corrected before the pump cover plate is pulled fully into place.

4. Torque all bolts to 20 foot-pounds.
5. Repeat front unit end play check as described in Note 30n.
6. Install remaining bolt (E) in driven support housing, tightening to 20 foot-pounds.

f. Oil Pump

1. Disassembly

a. Mark drive and driven gears for reassembly in same position and remove the pump body.

NOTE: Installing the gears in the same position as removed will assure the quietest operation, as the gear teeth will mesh in the established wear pattern.

b. Remove drive and driven gears from pump body.
c. Remove and discard pump body to case square-cut O-ring seal.

2. Inspection

a. Using tip of finger, inspect gear pocket and crescent for nicks, burrs, scoring or galling.
b. Inspect drive gear for nicks, burrs, scoring, or galling.
c. Inspect driven gear for nicks, burrs, scoring, or galling.
d. Place pump gears in pump body and check pump body face to gear face clearance. Clearance should be .0013" inch - .0035" inch.
e. Check face of pump body for nicks, burrs, scoring, or galling.
f. Check pump body face flatness. Overall flatness should be .000" to .002".
g. Inspect bushing for nicks, burrs, scoring, galling, out-of-round, or excessive wear.

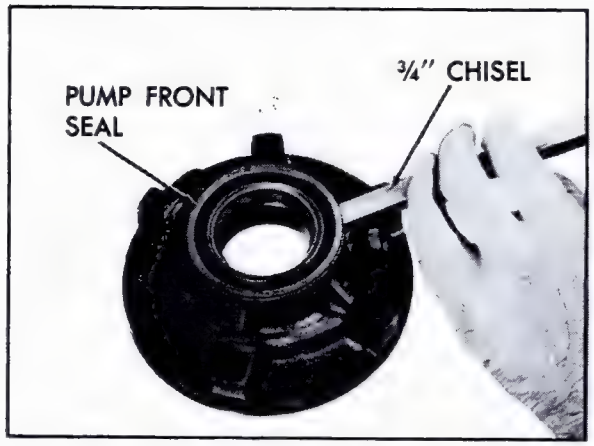


Fig. 7-209 Removing Pump Front Seal

NOTE: To check for out-of-round, install pump body on the converter hub and look for eccentricity between pump bushing and converter hub.

h. Check for damaged pump cover plate bolt holes.

i. Inspect front seal for damage. If replacement of front seal is necessary, use a standard 3/4" cold chisel and pry front seal from pump body, Fig. 7-209.

3. Assembly

a. If necessary, install a new front seal, using Pump Oil Seal Installer, J-21359, to drive seal in place. Use a non-hardening sealer on outside of seal before installing into pump, Fig. 7-211.

b. Install new pump to case square-cut O-ring seal, Fig. 7-211.

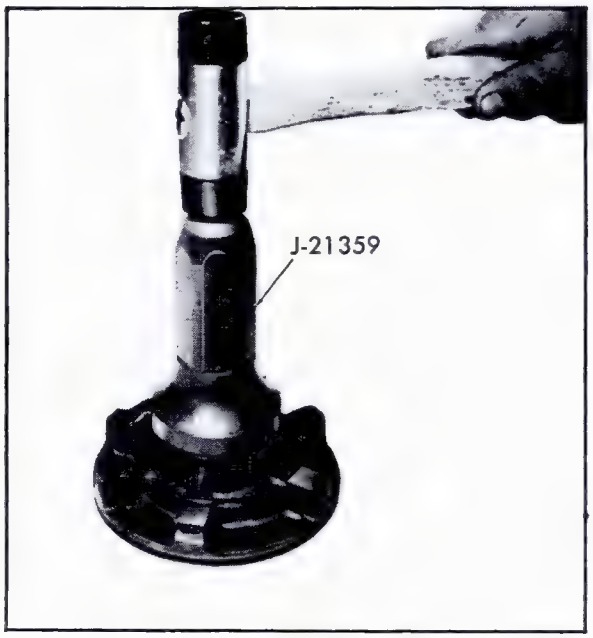


Fig. 7-210 Installing Pump Front Seal

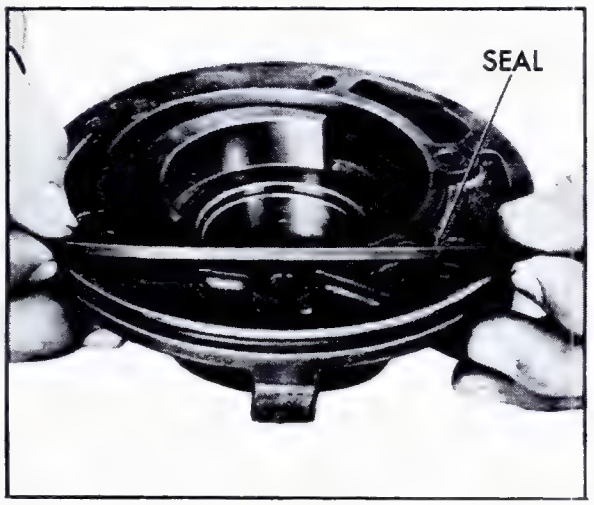


Fig. 7-211 Installing Pump to Case Seal

c. Install driven gear into pump body with alignment mark up.

d. Install drive gear into pump body with drive tangs up, Fig. 7-212.

NOTE: Drive gear should always be installed with counterbore down.

4. Install

a. Rotate transmission in holding fixture base so that cored oil passages are up.

b. Install pump assembly over stator shaft and position to drive support housing, rotating pump as necessary to align holes in pump cover plate with pump attaching bolt holes.

c. Install six retaining bolts (F), finger tight, Fig. 7-208.

d. Rotate transmission in holding fixture base so that pump cover plate is up.

e. Tighten pump attaching bolts to 20 ft. lbs.

g. Install Sprockets, Link Assembly and Sprocket Cover

1. Rotate transmission in holding fixture base so that cored oil passages are up.

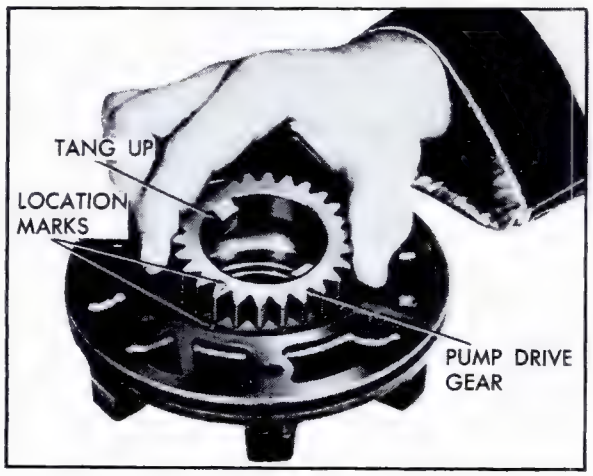


Fig. 7-212 Installing Pump Drive Gear

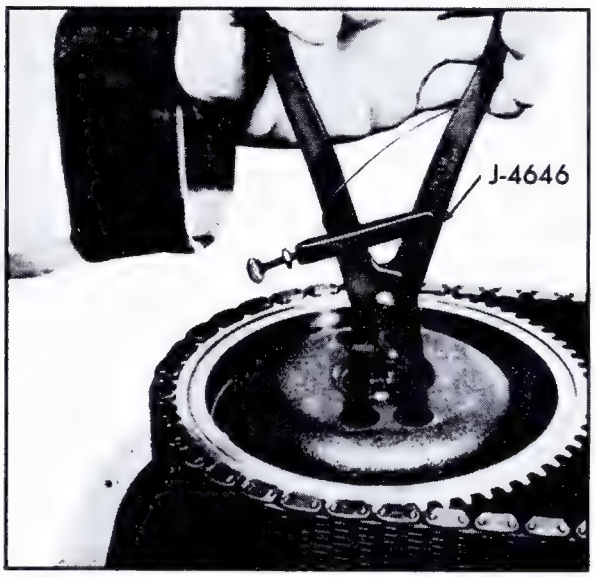


Fig. 7-213 Installing Sprocket Snap Rings

2. Position drive and driven sprockets on workbench with shafts up, and drive sprocket closest to transmission.

3. Install link assembly over drive and driven sprockets with colored guide link down.

4. Lift sprockets and link assembly and rotate assemblies 90° so that drive sprocket is up.

5. Allowing driven sprocket to hang down freely, start turbine shaft into pump support housing until it will support weight of assembly.

6. Start input shaft into driven support housing, and alternately push shafts inward until sprockets are installed.

7. Rotate transmission in holding fixture base so that sprockets are up.

8. Using a plastic mallet, gently tap sprockets to seat sprocket bearing assemblies into support housing.

9. Install Snap Ring Pliers, J-4646, into sprocket bearing retainer snap rings, located under the drive and driven sprockets, and install snap rings into retaining grooves on support housings, Fig. 7-213.

10. Install new sprocket cover to case gasket on transmission case.

11. Position sprocket cover to transmission case and install 18 attaching bolts, tightening bolts to 8 ft. lbs.

NOTE: One sprocket cover attaching bolt is 1/4 inch longer. This bolt must be installed in the tapped hole directly over the cooler fittings on the transmission case.

12. Chain cover insulator should fit snug.

h. Detent Lever, Manual Shaft, Parking Linkage, Rear Servo, Front Servo, Check Balls, and Control Valve Spacer

1. Inspect Detent Lever, Manual Shaft, and Parking Linkage

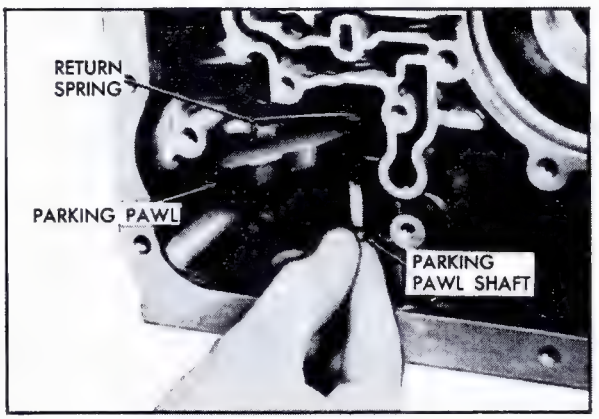


Fig. 7-214 Installing Parking Pawl

a. Inspect parking actuator rod for cracks, or broken spring retainer lugs.

b. Inspect actuator spring for damage.

c. Inspect actuator for a free fit on actuator rod.

d. Inspect parking pawl for cracks or wear.

e. Inspect manual shaft for damaged threads.

f. Inspect inside detent lever for cracks or a loose pin.

g. Inspect parking pawl return spring for deformed coils or ends.

h. Inspect parking bracket for cracks or wear.

i. Inspect detent spring and roller assembly.

2. Install Detent Lever, Manual Shaft and Parking Linkage

a. Install parking pawl (tooth toward inside of case), pawl return spring and parking pawl shaft into case, Fig. 7-214.

b. Install parking pawl shaft retaining pin into case hole.

c. Install parking bracket into case, tightening attaching screws to 18 ft. lbs.

d. Install a new manual shaft O-ring seal on manual shaft.

e. Install the actuator rod plunger under the parking bracket and over the parking pawl and through hole in detent lever. Position detent lever in transmission case.

f. Install the manual shaft assembly through the case and detent lever, Fig. 7-215, and install the retaining lock nut on manual shaft.

g. Install manual shaft retaining pin into case, long smooth end first.

h. Torque lock nut to 18 ft. lbs.

3. Disassemble Rear Servo Assembly (Fig. 7-216)

a. Remove rear accumulator piston from rear servo piston.

b. Remove E-ring retaining rear servo piston to band apply pin.

c. Remove rear servo piston and seal from band apply pin.

d. Remove washer, spring and retainer.

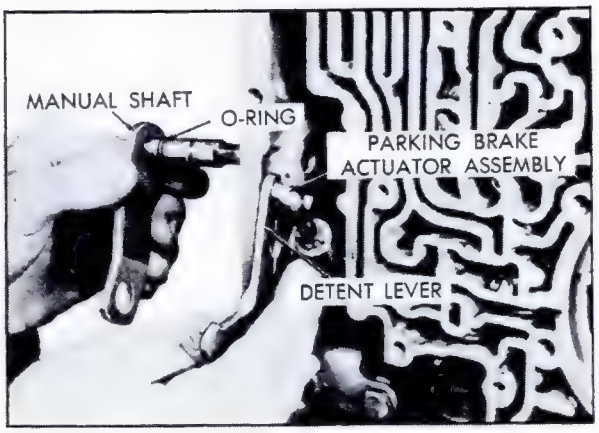


Fig. 7-215 Installing Manual Shaft

4. Inspect Rear Servo

a. Inspect fit of oil seal rings in accumulator piston. Clearance between side of ring and groove should be free with a maximum clearance of .003 inch.

b. Install accumulator oil seal ring in case bore and check fit of ring to bore.

c. Inspect fit of band apply pin in servo piston.

d. Inspect band apply pin for scores or cracks.

e. Inspect band apply pin for proper size as determined by pin selection check (Note 30h).

5. Assemble Rear Servo

a. Install spring retainer, cup side first, servo pin spring and washer on servo pin.

b. Install servo piston on pin and secure with E-ring retainer.

c. If removed, install oil seal ring on servo piston.

d. If removed, install inner and outer oil rings on accumulator piston.

e. Install accumulator piston into bore of servo piston.

6. Install Rear Servo

a. Lubricate inner and outer rear servo bores in transmission case with transmission fluid and install rear accumulator spring in servo inner bore.

NOTE: Before installing rear servo assembly, make certain that rear band apply lug is aligned with servo pin bore in transmission case. Otherwise servo pin will not apply band.

b. Position rear servo assembly in transmission case bore.

c. Press down on rear servo assembly, making certain oil seal ring is properly seated in case bore.

7. Inspect Front Servo

a. Inspect servo pin for damage.

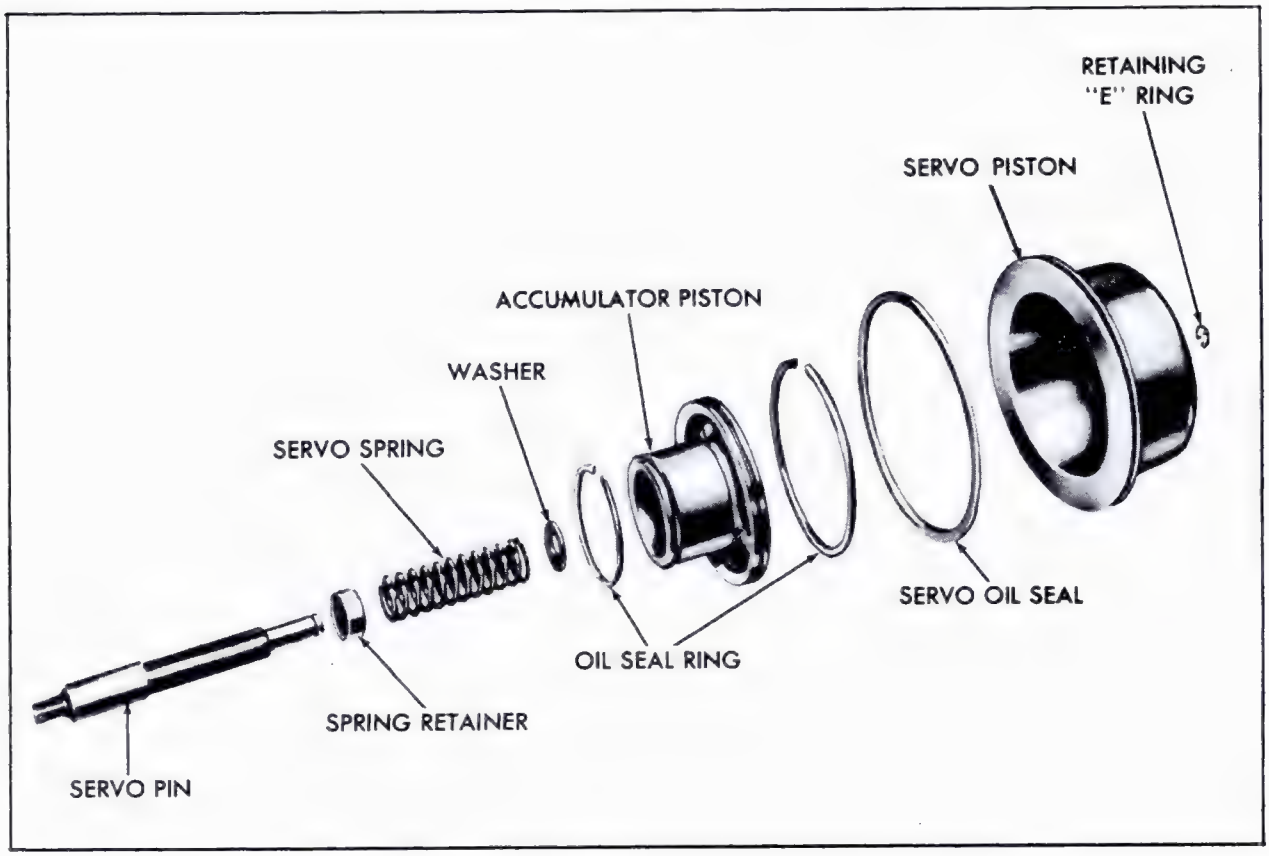


Fig. 7-216 Rear Servo and Accumulator Assembly Disassembled

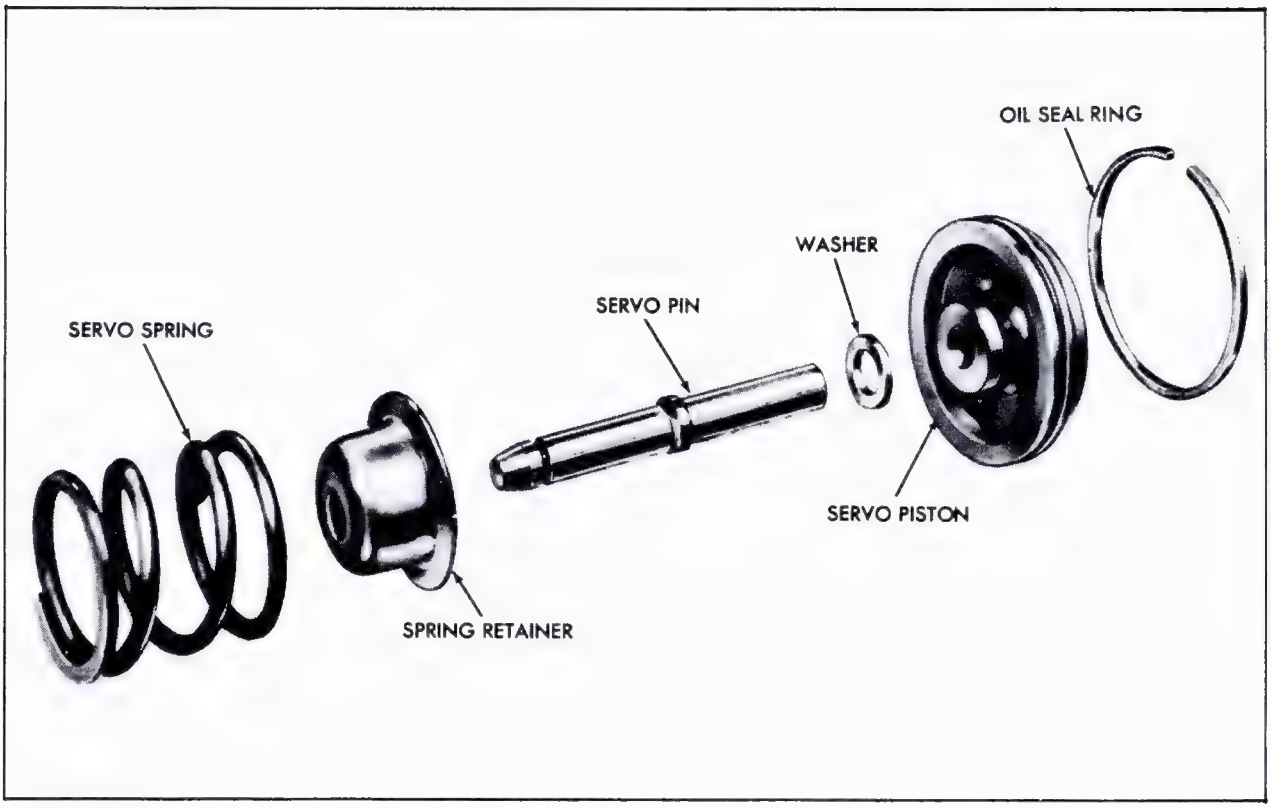


Fig. 7-217 Front Servo Disassembled

b. Inspect piston for damaged oil ring groove, check freedom of ring in groove.
c. Inspect piston for cracks or porosity.
d. Check fit of servo pin in piston and case.

8. Install Front Servo Assembly

a. Reassemble parts of front servo, Fig. 7-217, making sure tapered end of servo pin is pointing through the spring and spring retainer, and install in bore in case.

9. Install Check Balls and Control Valve Spacer

a. Install seven check balls in cored passages, Fig. 7-218.
b. Install valve body spacer to case gasket on transmission case.

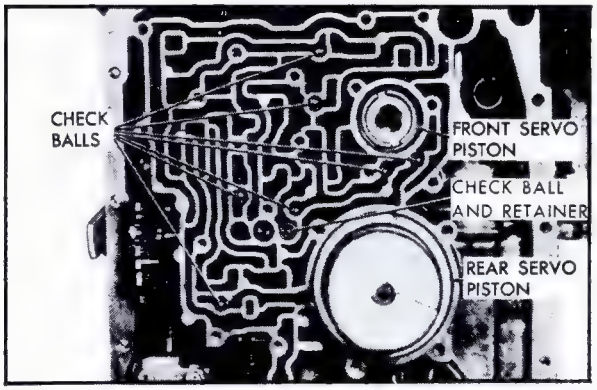


Fig. 7-218 Location of Check Balls

c. Install valve body spacer on transmission.

NOTE: Valve body spacer to case gasket should extend approximately 1/8 inch beyond the spacer plate, over the void case channel, Fig. 7-219. If service gaskets are being installed, the valve body spacer to case gasket has an extension which will cover the void case channel.

d. Install valve body to spacer gasket.
e. Install guide pins.

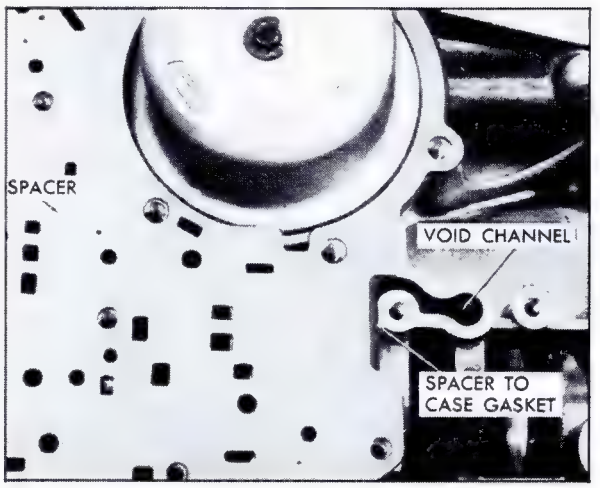


Fig. 7-219 Valve Body Spacer to Case Gasket Identification

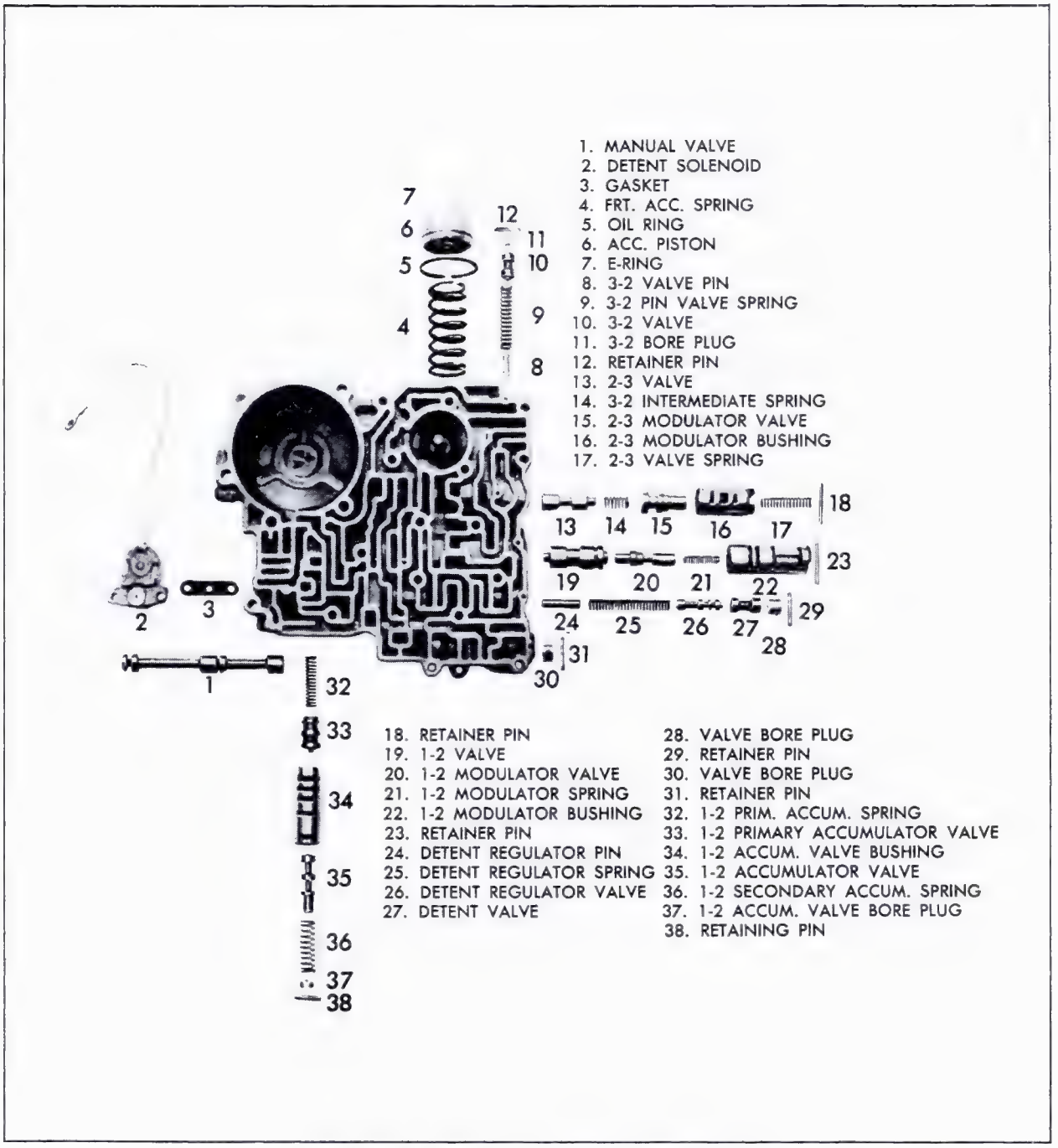


Fig. 7-220 Control Valve Assembly Disassembled

i. Control Valve Assembly (Fig. 7-220)

1. Disassembly

When disassembling control valve, make certain that springs are accurately identified so that they can be properly reassembled.

a. Position control valve assembly with cored face down.

b. Remove two screws securing detent solenoid to control valve body and remove detent solenoid and gasket.

c. Position control valve assembly with cored face up and accumulator pocket on bottom.

d. Remove manual valve from upper bore.

e. Install Control Valve Accumulator Piston Installer, J-21885, on accumulator piston, compress piston and remove E-ring retainer, Fig. 7-221.

f. Remove Installer, J-21885, and remove accumulator piston and spring.

g. Using pin punch, remove retaining pin from lower left bore, pressing on pin from outer side of valve body. Remove 2-3 modulator bushing, 2-3 shift valve spring, 2-3 modulator valve, 3-2 intermediate spring and 2-3 shift valve from lower left bore.

NOTE: 2-3 modulator valve will be inside of 2-3 modulator bushing.

h. Using pin punch, remove retaining pin from lower center left bore, pressing on pin from outer side of valve body. Remove 1-2 modulator bushing, 1-2 modulator valve and spring and 1-2 shift valve from lower left center bore.

NOTE: 1-2 modulator valve and spring may be inside of 1-2 modulator bushing.

i. Using pin punch, remove retainer pin from upper left center bore by pressing on outer side of valve body.

CAUTION: Hold hand over bore when removing retainer pin as detent regulator valve spring may force other components out of bore.

j. Remove bore plug, detent valve, detent regulator valve, spacer and detent regulator valve spring from upper left center bore.

k. Remove retaining pin from bottom bore on left side by prying out with a pair of long nose pliers.

CAUTION: Hold hand over bore when removing retainer pin as 3-2 valve spring may force bore plug out.

l. Remove bore plug, 3-2 valve, spring and spacer from bottom left bore.

m. Remove retaining pin from top bore by prying out with long nose pliers from outer side of valve body.

CAUTION: Hold hand over bore when removing retainer pin as accumulator springs may force other components out of bore.

h. Remove bore plug, 1-2 accumulator valve bushing, 1-2 accumulator valve and secondary spring, 1-2 accumulator primary valve and spring.

2. Inspection

a. Wash control valve body, valves, and other parts in clean solvent.

CAUTION: Do not allow valves to bump together, as this might cause nicks and burrs.

b. Inspect all valves and bushings carefully to make sure that they are free from dirt and are not damaged in any respect. If burrs are present, they should be removed with a fine stone or fine grade of crocus cloth and light oil. Be careful not to round off shoulders of valves.

c. All valves and bushings should be tested in their individual bores to make certain that free movement can be obtained. All valves should fall freely of their own weight with a slight tapping action on the body. In checking be careful to prevent valve damage in any way.

d. The manual valve is the only valve that can be serviced separately. If other valves are defective or damaged beyond repair, a new control valve assembly should be installed.

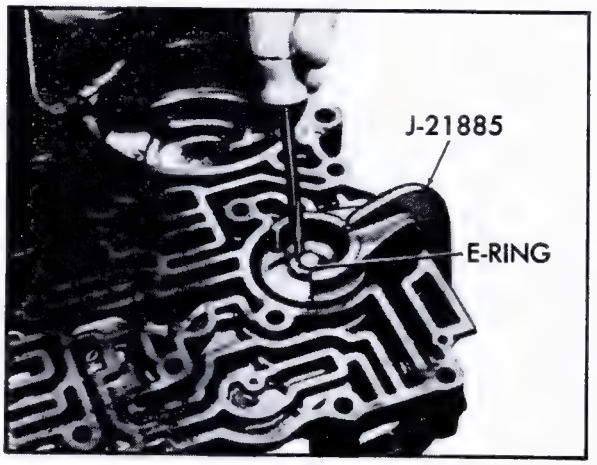


Fig. 7-221 Removing Front Accumulator

e. Inspect body for cracks or scored bores.

f. Check all springs for distortion or collapsed coils.

3. Assembly (Fig. 7-220)

a. Position control valve body with cored face up and accumulator pocket on bottom.

b. Install the 1-2 primary accumulator spring into the 1-2 primary accumulator valve and install both, spring first, into top bore.

c. Install the 1-2 accumulator valve, wide land first, into the 1-2 accumulator bushing.

d. Install the 1-2 accumulator valve bushing into the top bore, aligning the square port on the end of the bushing with hole for retaining pin.

e. Install the 1-2 secondary accumulator spring and the 1-2 bore plug into bushing.

f. Compress 1-2 accumulator valve train, install retaining pin from outer side of valve body, pressing pin flush with valve body.

g. Insert spacer inside of 3-2 valve spring and install spring and spacer in bottom left bore.

h. Install 3-2 valve in bottom left bore.

i. Compressing 3-2 valve spring, install bore plug, hole end out, and secure with grooved retaining pin from cored side of valve body.

j. Insert spacer inside of detent regulator valve spring and install spring and spacer into upper left center bore, making certain spring seats in bottom of bore.

k. Compress detent regulator valve spring and hold with a small screwdriver placed between end of spring and wall on cored side of valve body.

l. Install detent regulator valve, stem end out, and detent valve, small land first, into upper left center bore.

m. Insert bore plug, hole out, into upper left center bore and, pressing inward on bore plug, remove screwdriver and install remaining pin from cored side of valve body.

n. Install 1-2 shift valve, longer stem end first, in lower left center bore, making certain valve seats in bottom of bore.

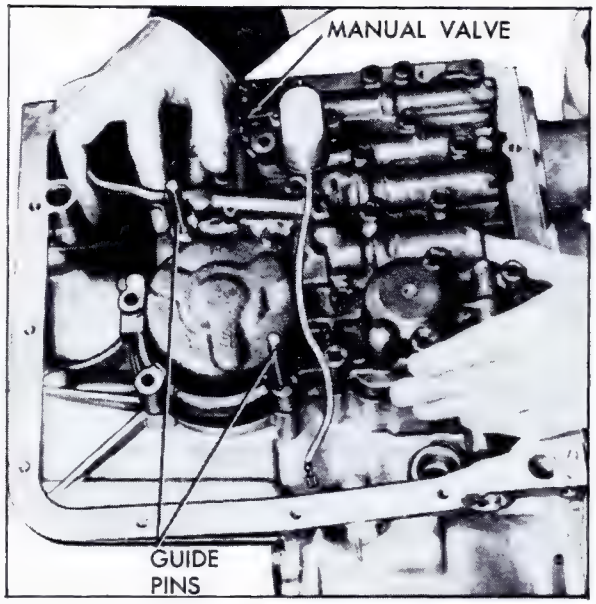


Fig. 7-222 Installing Control Valve Assembly

o. Install 1-2 modulator spring into 1-2 modulator valve and install, hole end first, into 1-2 modulator bushing. Install assembly in lower left center bore of control valve body, open end of bushing first.

p. Compress bushing against spring and secure with retaining pin from cored side of control valve body.

q. Install 3-2 intermediate spring on stem end of 2-3 shift valve, and install valve and spring, valve first, into lower left bore. Make certain valve seats in bottom of bore.

r. Install 2-3 modulator valve, hole end first, into 2-3 modulator bushing and install both parts in lower left bore.

s. Install 2-3 shift valve spring into hole in 2-3 modulator valve, and compressing spring, secure with retaining pin from cored side of control valve.

t. Position front accumulator spring and piston into valve body and install Control Valve Accumulator Piston Installer, J-21885, on piston. Compress spring and piston, aligning spring and piston with bore, Fig. 7-221.

CAUTION: Make certain that piston pin is correctly aligned with hole in piston and that oil seal ring does not catch on lip of bore when installing piston.

u. Secure piston and spring with E-ring retainer and remove Installer, J-21885.

v. Install manual valve into top bore.

w. Placing control valve assembly on cored surface, position detent solenoid gasket and detent solenoid on valve body.

x. Install detent solenoid attaching screws.

y. Install governor drive pipe into control valve body in bore by rear servo cover.

4. Install Control Valve Assembly

a. Using two guide pins, Fig. 7-222, install control valve assembly and governor pipe on transmission. Make certain gaskets and spacer do not become mispositioned.

NOTE: Check manual valve to make sure it is indexed properly with pin on detent lever and governor pipe to make certain it is properly seated in case hole.

b. Remove guide pins and install control valve assembly attaching screws, eliminating detent roller and spring assembly attaching screw. Torque bolts to 8 foot-pounds, Fig. 7-223.

c. Install detent roller and spring assembly and attaching screw. Tighten screw to 8 foot-pounds.

d. Install detent terminal to case connector.

e. Install governor feed pipe in transmission case and control valve body.

NOTE: Make certain that governor feed pipe is seated in bores in case and valve body.

j. Pressure Regulator Valve Intake Pipe and Strainer Assembly, Bottom Pan, Modulator Valve and Modulator

1. Install Pressure Regulator Valve

a. Install spring retainer on pressure regulator spring. Also install spacers if previously removed, Fig. 7-224.

b. Install pressure regulator valve on spring, stem end first.

c. Install boost valve into bushing, stem end out, and stack parts so that pressure regulator spring is against valve bushing.

d. Install complete assembly, pressure regulator valve first, into pressure regulator valve bore, being careful not to drop parts during installation.

e. Using a screwdriver or steel rod, compress regulator boost valve bushing against pressure regulator spring until it is beyond snap ring groove, and install snap ring using Snap Ring Pliers, J-5403 (#21), Fig. 7-225.

NOTE: To facilitate installation of snap ring, encircle it around screwdriver or steel rod, compress tangs with snap ring pliers, and slide snap ring into ring groove in valve bore.

2. Install Intake Pipe and Strainer Assembly and Bottom Pan

a. Install new intake pipe O-ring into pipe bore in transmission case and install intake pipe and strainer assembly.

b. Install new bottom pan gasket on transmission case and install bottom pan.

c. Install 13 bottom pan attaching screws. Tighten screws to 12 foot-pounds.

3. Inspect Vacuum Modulator and Valve

a. Inspect vacuum modulator for any signs of bending or distortion.

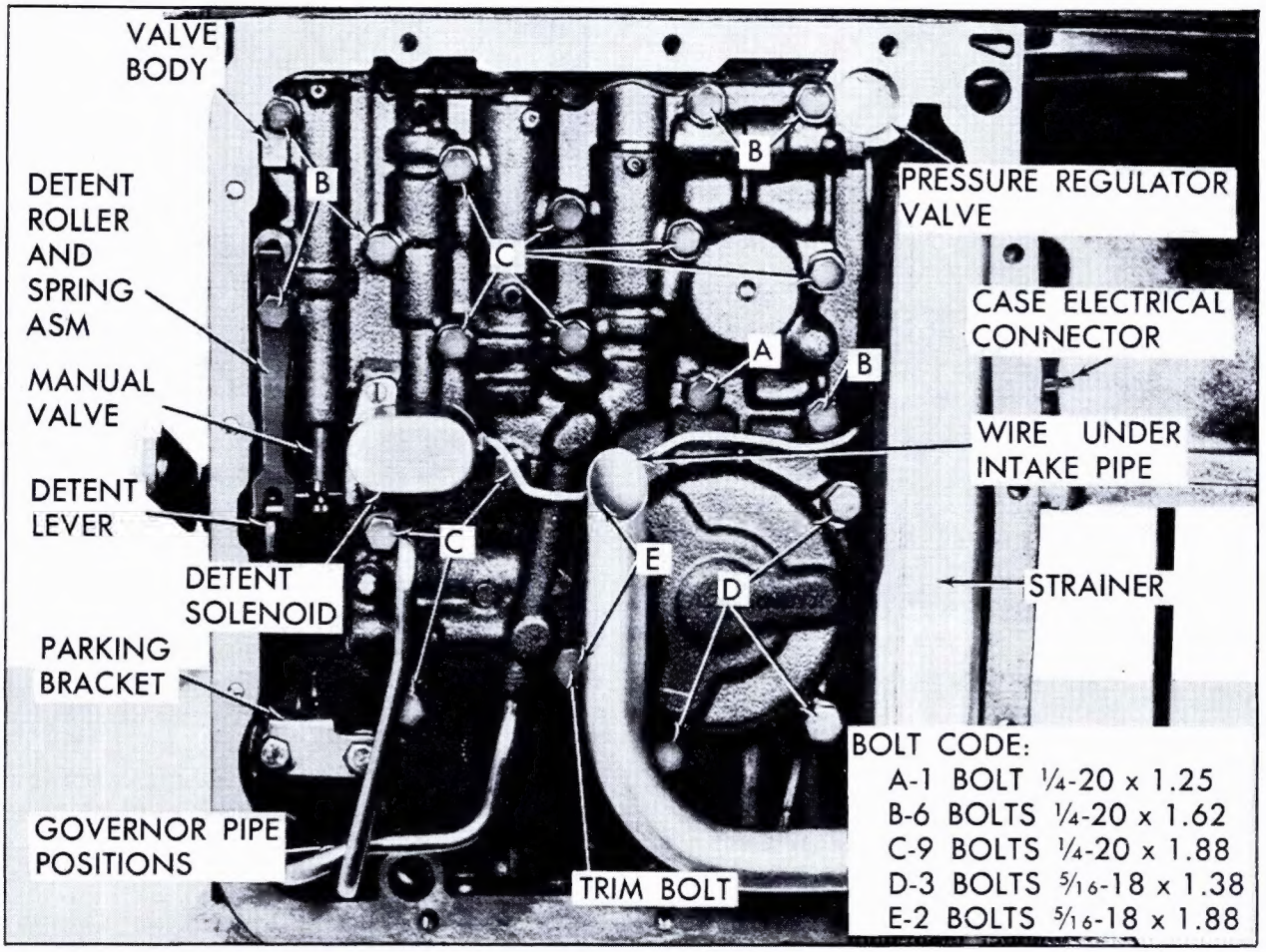


Fig. 7-223 Control Valve Bolt Chart

b. Inspect O-ring seat for damage.

c. Inspect modulator valve for nicks or damage.

d. Check freeness of valve operation in case bore.

e. Check modulator for damaged bellows. Modulator plunger is under approximately 16 pounds pressure. If bellows is damaged, plunger will have very little pressure. Use procedure outlined in Note 1f.

4. Install Modulator Valve and Vacuum Modulator

a. Install modulator valve into case with stem end out.

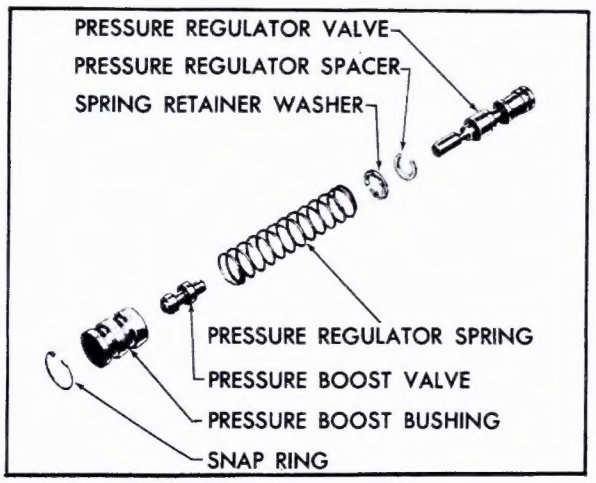


Fig. 7-224 Pressure Regulator Valve Disassembled

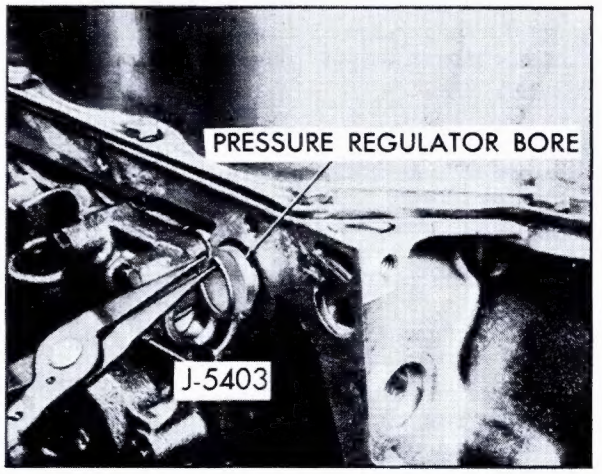


Fig. 7-225 Installing Pressure Regulator Valve

Fig. 7-226 Installing Governor Assembly

b. Install new O-ring on vacuum modulator.
c. Install vacuum modulator into case with vacuum hose pipe facing case connector.
d. Install modulator retainer with curved side of tangs inboard and install attaching screw. Tighten screw to 18 foot-pounds.

k. Governor and Speedometer Driven Gear

1. Inspect Governor

NOTE: All components of the governor assembly, with the exception of the driven gear, are a select fit and each assembly is calibrated. The governor, including the driven gear, is serviced as a complete assembly.

a. Wash all parts in cleaning solvent, air dry and blow out all passages.
b. Inspect governor sleeve for nicks, burrs, scoring or galling.
c. Check governor sleeve for free operation in bore of transmission case.
d. Inspect governor valve for nicks, burrs, scoring or galling.
e. Check governor valve for free operation in bore of governor sleeve.
f. Inspect governor driven gear for nicks, burrs, or damage.
g. Check governor driven gear for looseness on governor sleeve.
h. Inspect governor springs for distortion or damage.
i. Check governor weights for free operation in their retainers.
j. Check valve opening at entry and exhaust (.020 inch minimum).

2. Install Governor

a. Rotate transmission in holding fixture base so that governor bore is up.

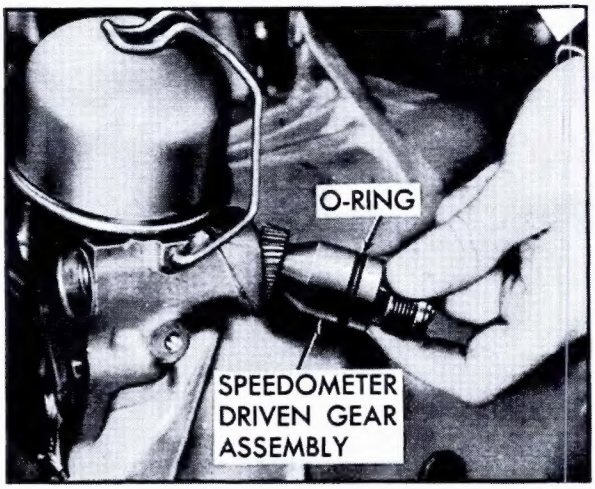


Fig. 7-227 Installing Speedometer Driven Gear Assembly

b. Install new square cut O-ring seal on governor assembly and install assembly into transmission case, Fig. 7-226.
c. Position retaining clip on top of governor assembly.

3. Inspect Speedometer Driven Gear Assembly

a. Inspect gear for damaged teeth or shaft.
b. Inspect sleeve for scores, damaged threads or cracks.

4. Install Speedometer Driven Gear Assembly

a. Install new O-ring seal on speedometer driven gear assembly.
b. Install speedometer housing and seal assembly and red nylon driver gear into transmission case, Fig. 7-227.
c. Position retaining clip to transmission and driven gear assembly and secure with one attaching bolt, tightening bolt to 3 ft. lbs.

l. Converter

1. Inspect Torque Converter

a. Check converter for leaks as described in Note 15.
b. Check converter hub surfaces for signs of scoring or wear.

2. Install Torque Converter

a. Position transmission jack with adapter plate to transmission and install transmission on jack using brace and safety chain.
b. Carefully position converter on turbine shaft, making certain converter is properly aligned. Long screws or eyebolts can be threaded into the weld nuts on the converter and used as handles.
c. Rotate converter until the shafts are piloted and the converter lugs are indexed in the pump gear.
d. If difficulty is experienced in alignment, tap on outer diameter of converter with plastic-headed hammer, while turning converter.

e. Install Converter Holding Clamp, J-21366, on transmission case.

f. Remove Transmission Holding Fixture, J-22240, from transmission.

TORQUE CHART

APPLICATION	FT. LBS.
Transmission to Engine Bolts	25
Torque Converter to Flywheel	30
Flywheel Housing Cover	5
Final Drive to Transmission	25
Starter Motor to Transmission	25
Solenoid to Case Screw	10
Line Pressure Plug	13
Vacuum Modulator Retainer	18
Valve Body to Case	8
Center Support to Case	23
Manual Shaft to Inside Lever	18
Pump Body to Cover Plate	20
Parking Brake Bracket to Case	18
Oil Pan to Case	12
Sprocket Housing	8
Support Housing to Cover Plate	20
Speedometer Driven Gear Retainer	6

SPECIAL TOOLS

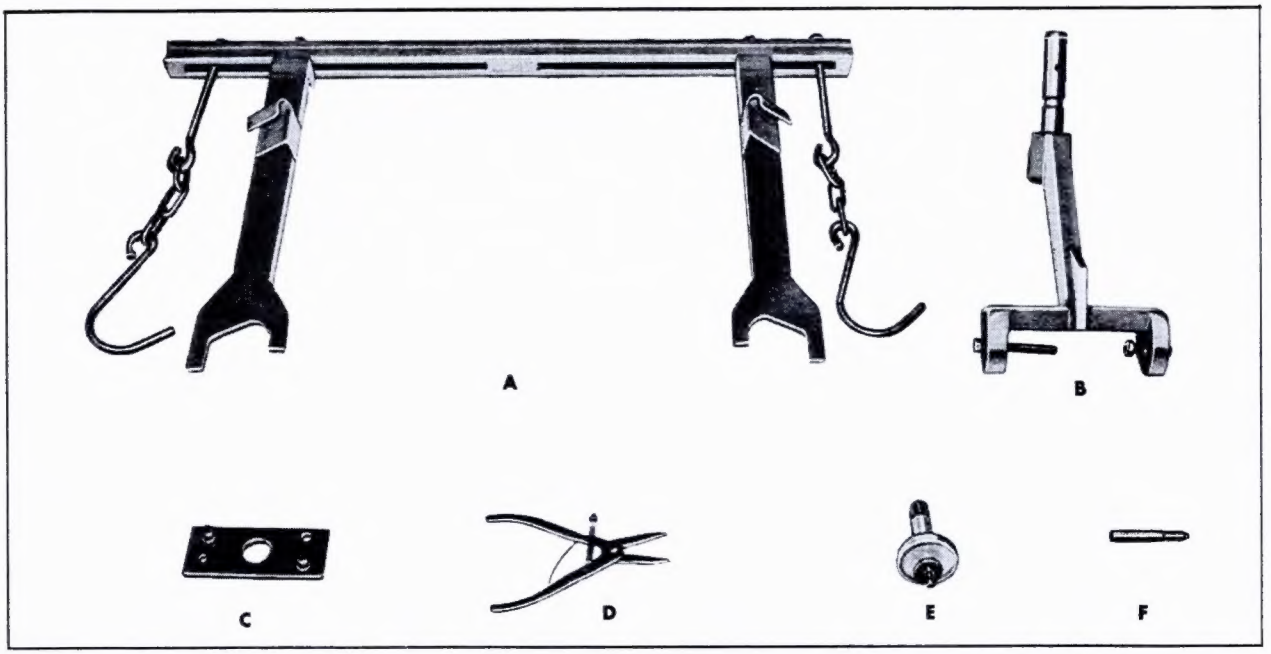


Fig. 7-228 Special Tools

Key	Tool No.	Name	Key	Tool No.	Name
A	J-22825	Engine Support Fixture	D	J-4646	Snap Ring Pliers
B	J-22240	Transmission Holding Fixture	E	J-22241	Front Unit End Play Checking Tool
C	J-21370-8	Band Apply Adapter Plate	F	J-21370-7	Band Apply Adapter Pin

NOTE: The above Special Tools are required in addition to most tools shown in Fig. 7-121 to properly overhaul the Turbo Hydra-matic transmission used on the Fleetwood Eldorado.